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Ceramic Abstracts

EDWARD W. WASHBURN, Editor
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ABSTRACTORS: E. N. BUNTING; W. M. CLARK, G. S. FULCHER, S. L. GALPIN, A. T. MALM, R. J. MONTGOMERY, LOUIS NAVIAS, C. W. PARMELEE, C. M. SAEGER, JR., H. G. SCHURECHT, R. B. SOSMAN, H. F. STALEY, E. W. TILLOTSON.

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General and Miscellaneous

1. Glimpses of Ohio ceramic industries. I. CHESTER H. JONES. *Chem. Met. Eng.*, **25**, 562–66(1921).—Ohio holds first place among the states in the production of ceramic wares, producing about 24 percent of the total annual output of claywares in the U. S. General descriptions are given of the processes used in making chem. stoneware at the plant of the U. S. Stoneware Co. at Akron and in making common stoneware at the plant of Ramsbottom Bros.' Pottery Co. at Roseville. H. F. S.

2. Fine grinding. No. 2. The influence of the shape of the particle. L. G. HILL. *Trans. Ceram. Soc.*, **19**, 3–13(1920).—It is stated that the Griffin mill has proven satisfactory for preliminary grinding of pottery materials when followed by magnetic separation of iron particles and wet pan grinding. H. F. S.

PATENTS

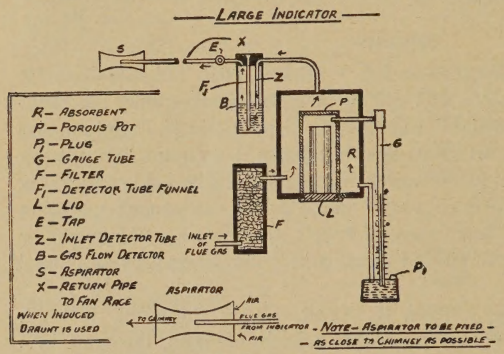
3. Alkali silicates. F. J. PHILIPS and E. J. ROSE. Brit. 151,339, June 19, 1919. In order to obtain a sol. alkali silicate of high silica content, the product obtained by the fusion of alkali and silica is dissolved in H_2O and an acid then added, whereby gelatinous silicic acid is thrown down, and this ppt. by continued agitation is made to redissolve in the soln. The acid, preferably H_2SO_4, may be added in the form of spray; and after the subsequent operation of agitation or grinding, the soln. may be evapd. to dryness. Moreover, to increase the fusibility of the alkali and silica, a little borax may be employed in the fusion process. (*C. A.*)

4. Process for treating clay. JOHN H. RYAN. U. S. 1,385,716, July 26, 1921. The process of treating clay consisting first, in breaking the same into small lumps and then drying in the presence of heat for the purpose of a preliminary oxidization, mixing with a surplus of water to settle out any grit, adding thereto ammonia to neutralize any acid in the clay, introducing the pulp into a pebble mill to grind the same and to thoroughly admix the ammonia therewith, next adding a bleaching agent, of one-half of one percent of the water content, and continuing the action of the pebble mill for a period of substantially two hours to fully admix the chem. therewith and secure its action, thereafter diluting the pulp to draw the same from the mill and subjecting it to an agitator to entirely dissolve and remove the chem. settling, and decanting the water, withdrawing the pulp and filtering the same, and subjecting the thick pulp to a drying action to finish the product. C. M. SAEGER, JR.

5. Dry-kiln. JOSEPH F. HIRT. U. S. 1,385,451, July 26, 1921. A kiln having a drawing chamber and a heating chamber; means for circulating air through the chambers; means whereby fresh air is admitted to the circulating air at a point where it will pass through the heating chamber before entering the kiln chamber, thereby thoroughly mixing and heating the additional fresh air with the recirculating air, before entering the drying chamber; means for supplying humidity to the air before it enters the drying chamber; and means for varying the amt. of humidity supplied to various portions of the kiln. C. M. SAEGER, JR.

Apparatus and Instruments

6. Scientific control of combustion. H. T. RINGROSE. *J. Iron and Steel Inst.* (Adv. copy No. 8), 9 pp. (1921); *Engineering*, **111**, 565–66; *Engineer*, **131**, 511–12; *Iron and Coal Trades Rev.*, **102**, 628–29.—An app. and a method are described for recording automatically and continuously the *amt. of CO_2 in flue gases* by measuring on a manometer tube the amt. of vacuum obtained in a porous pot containing a soda-lime absorber and surrounded by an atm. of flue gases, the amt. of vacuum produced depending solely on the % of absorbable gas surrounding the pot. It measures very small amts. of CO_2 even that in ordinary air or about 0.04%. The quickness or responsiveness of the indication depends solely on the porosity of the pot. The app., as shown in the figure, consists of an aspirator connected to the flue under observation, a filter and a chamber contg. the porous pot, inside which is the dry absorbing reagent. A pipe connects the chamber with a vessel of water, into which dips one end of a graduated tube, the other end being extended into the porous pot. As soon as absorption begins, the vacuum produced and the % of CO_2 are read off directly. Another similar app., the W. R. Producer CO_2 Indicator, has been devized for measuring *the CO_2 in producer gas*. For neutralizing the effect of the H another similar pot is provided with a dummy cartridge with no absorbent and H is passed through setting up in both pots opposing diffusion pressures; the difference in reading on the manometer tube is proportional to the per cent of CO_2 in the mixt. It is accurate to within 0.0–0.6% as compared with an Orsat app. This affords a direct and scientific control of producer gas quality. Attempts are being made to design an instrument so sensitive as to show variations in CO_2 in a water-gas plant from second to second instead of the av. over a certain period. J. L. WILEY (*C. A.*)



7. The Avrutik continuous and automatic shifting process for separating liquids and solids. JOSEPH AVRUTIK. *Louisiana Planter*, **66**, 379–80(1921).—A design of the app. and description of the principles involved are given. Three centrifugal baskets placed one above the other, and permitting an overflow for solids from the upper basket into the lower baskets, are the principle features of the app. The material under treatment can be washed as desired. C. H. CHRISTMAN (*C. A.*)

8. New testing machines. II. Hardness testing machines. E. IRION. *Z. Ver. deut. Ing.*, **65**, 315–20(1921).—Five new instruments for measuring

the *hardness of metals*, four by the Brinell method and one by the Martens-Heyn method, are described. F. P. Flagg (*C. A.*)

9. The Atkins centrifugal filter press. Anon. *Caliche*, **2**, 148(1920).—The advantages which the rotation of the filtering medium is stated to give are: (1) Continuous elimination of the solids from the filter cloth by the centrifugal action due to the rotating filter disks. (2) The solid materials are deposited in the form of a paste on the walls of the container. (3) The filtered soln. discharges immediately and does not accumulate. (4) Either pressure or vacuum may be used. (5) Discharge of the solid materials is continuous. The app. (of which drawings are given) consists in principle of several circular filtering disks mounted on a shaft which may be rotated, the whole being enclosed in a tank or container to which pressure may be applied.

C. L. Burdick (*C. A.*)

10. Drying stoves scientifically designed. B. J. Allen. *Trans. Ceram. Soc.*, **19**, 26–41(1920).—A description of the conveyor type of pottery dryer now used in the U. S. A. H. F. S.

11. A new centrifugal filter press. C. R. Platzmann. *Tonind. Ztg.*, **45**, 1081–82(1921).—A new centrifugal filter press made by Stancourt, Son's and Muir Ltd., London, is described. The substance to be dewatered is fed into the center of the centrifuge which rotates at about 45 revolutions per sec. and the slip is thrown with great force (1 kg. per $cm.^2$) against a filtering medium. The dewatered clay is thrown against the outside of the centrifuge while the water is forced out below. When the chamber inside of the centrifuge has become filled with clay the operation is stopped until same has been removed. This is done by raising the outer shell. This takes about 2 min. and 2 men can operate 4 filter presses. The coarse material is separated from the fine in this filter press which for certain purposes is an advantage. This press requires less space than others and permits the use of high pressures.

H. G. Schurecht

12. Uehling carbon dioxide recorder. Anon. *Engineering*, **111**, 626–27 (1921).—A const. flow of flue gas is drawn through a chamber containing an absorbing medium. The CO_2 in the stream is absorbed and the resulting change in pressure is recorded by a manometer graduated directly in per cent CO_2. 4 illus. H. Buttler (*C. A.*)

PATENTS

13. Thermocouple for high-temperature measurement. T. Takizawa, J. Tsukamoto and Tokyo Denki Co. Japan 36,602. June 15, 1920. A couple is made of W and Mo wires, enclosed in a porcelain tube, which is maintained in vacuum or filled with H or A, perferably H at $^2/_3$ atm. It is used for the interval 1500–1850°. The e. m. f. of this couple increases proportionately to the increase of temp. at low-temp. interval; thermoelectric inversion occurs at 530°; the e. m. f. decreases, reaching zero near 1300° and changes direction. The e. m. f. in mv. is as follows: 1500° 2.82; 1600° 3.49; 1700° 4.25; 1800° 5.20; 1900° 6.20. (*C. A.*)

BOOK

14. Pyrometry: A practical treatise on the measurement of high temperatures. CHARLES R. DARLING. 2nd ed. revized and enlarged. 240 pp. 10s 6d net. For review see *J. Inst. Metals*, **25**, 484(1921). (*C. A.*)

See also No. 26.

See also No. 38.

Chemistry, Physics and Geology

15. On a hitherto unknown copper aluminate of the spinel type. J. ARVID HEDVALL AND JOSEF HEUBERGER. *Z. anorg. allgem. Chem.*, **116**, 137(1921).—CuO and Al_2O_3 in the mol. ratios 1:1, 1:2, and 2:1 were heated with 6 to 10 times their wt. of KCl at 850° for an hour and also without KCl at 900° for one week. Microscopical examn. indicated that the product from the 1 : 1 mixt. was homogeneous. The products purified by digestion with dil. HNO_3 to remove excess of CuO or Al_2O_3 yielded a brown powder, the compn. of which corresponded to $CuO.Al_2O_3$. The powder consisted of fairly well formed cubes and octahedra. A study of by-reactions observed when KCl was used as a flux is being made. W. E. T.

16. On the binary systems of lithium orthosilicate with zirconium orthosilicate and calcium orthosilicate. ROBERT SCHWARZ. *Z. anorg. allgem. Chem.*, **115**, 87(1921).—The system Li_4SiO_4–$ZrSiO_4$ was investigated thermally and optically from Li_4SiO_4 up to a compn. containing 70 mol. percent $ZrSiO_4$. A max. in the m. p. curve was found at the compn. $2Li_4SiO_4-3ZrSiO_4$ and a eutectic at 30 mol. percent $ZrSiO_4$. Since no mixed crystals were formed it was possible to calc. the mol. wt. of $ZrSiO_4$ from the lowering of the m. p. This was found to correspond to the simple formula $ZrSiO_4$. The system Li_4SiO_4–Ca_2SiO_4 was investigated up to 60 mol. percent $CaSiO_4$. The m. p. curve is a complicated one indicating mixed crystal formation and showing a max. at 40 mol. percent and 60 mol. percent Ca_2SiO_4. At lower temps. (about 932°) a molecular rearrangement takes place which indicates the formation of the compd. $Li_4SiO_4.Ca_2SiO_4$. The density data and the optical examination support this conclusion. E. W. T.

17. The measurement of the consistency of varnish. H. A. GARDNER AND P. C. HOLDT. Paint Mfgrs. Assoc. of U. S., *Circ.* **127**, 51 pp. (June 1921).—The authors define viscosity, plasticity, rigidity, and viscous and plastic flow. Abs. viscosities obtained with the Bingham variable pressure plastometer (*C. A.*, **14**, 1047) fitted with a modified receiver, on 37 different varnishes of various types ranged from 0.6 to 5.5 poises at 25°; these are tabulated against results obtained with the MacMichael and Doolittle torsion viscometers. Details of the operation of the instruments, calcn. of the capillary const. of the plastometer, discussion of accuracy, etc., are given. The MacMichael operated at accurately controlled low speeds and temp., might be used for research and routine work but it is not as accurate as the plastometer and exhibits a tendency to indicate viscosities lower than the true values. The Doolittle appears best adapted for routine testing although its readings can not

be calcd. to abs. viscosities. The Stormer and the Hadfield-Bawtree (*C. A.*, **15,** 180) viscometers are described. The occurrence of plasticity in varnishes can not well be explained on the hypothesis of solid friction, because ultramicroscopic examn. shows very few solid particles; but it may be due to emulsoid aggregates forming a continuous structure through the varnish.

F. A. WERTZ (*C. A.*)

18. Molecular force and plasticity of clays. HERBERT CHATLEY. *Trans. Ceram. Soc.*, **19,** 1–2(1920).—Suggestion is made that plasticity (and also, when the molecules of the fluid are considered, the specific "colloid" properties of sub-divided matter) is due to the presence of molecular forces comparable with wt. or other external agency. H. F. S.

19. Equilibria of hydrofluosilicic acid. LAWSON J. HUDLESTON AND HENRY BASSETT. *J. Chem. Soc.*, **119,** 403–16(1921).—The present accepted method of testing for silica in HF by adding KCl with formation of turbid K_2SiF_6 is found to be inadequate. A method of studying the compn. of mixts. of HF and H_2SiF_6 is found in the fact that for the complete neutralization of the latter acid, according to the equation $H_2SiF_6 + 6NaOH = 6MaF + H_2SiO_3 + 3H_2O$, an appreciable time is required. Thus when NaOH is added to the mixed acids the time may be measured from the moment of mixing till the color of the indicator (phenolphthalein) fades. Other additions of alkali are made until the color no longer fades. Since the total concn. of H ions is produced but slowly, they must be bound in a complex. If n cc. of alkali were originally present and N cc. were required for the total permanent neutralization $(N-n)/N\times 100 = C$ is the percentage of total H ions in bound condition at the moment of fading. The various values of *log C* plotted against time give the straight line usual for a monomol. reaction, from which C_0, the original concn. of the complex present in the unneutralized acid, is calcd. The rate of dissoc. of Na_2SiF_6 into SiF_4 and NaF is detd. The effect of temp. upon the velocity const. is given by the equation $\log k = (-9662/T) + 29.83$. Equil. conditions demand that when SiF_4 is passed into H_2O a considerable proportion of unchanged SiF_4 should be present, and the H_2SiO_3 can exist in soln. with an active mass proportional to its concn. to the extent of at least 0.003 mols. per 1. at 15°. G. L. CLARK (*C. A.*)

20. Influence of surface tension on fusion and solidification. ERNST RIE. *Wien. Anz.*, **1920,** 137–39.—In connection with a communication by Pavlov (*C. A.*, **3,** 860) R. develops an expression for the dependence of the m. p. T_2, of small, cryst. granules on the surface tension, S_{23} (free energy of the surface), in the form $Tp - T_0 = -T_0 \times 2S_{23}/s_3rq$, where T_0 is the limiting m. p. (without reference to surface energy), s_3 the density of the solid phase, r the radius of the cryst. granules considered as spheres, and q the latent heat of fusion. This expression, which is derived from the Gibbs equil. conditions by purely thermodynamic reasoning, and is readily adapted to the case of a drop enclosed within a crystal, gives results differing from those of Pavlov. Further observations of the m. p. of crystals are necessary to decide which of the conditions,

$S_{13} \gtrless S_{12}+S_{23}$ is valid. Probably, the majority of amorphous substances are composed of extremely minute crystals, the size of the granules being $> 10^{-5}$ cm.; the absence of a definite m. p. is to be ascribed to surface tensions. J. C. S. (*C. A.*)

21. Diffusion in silicate melts. N. L. Bowen. *J. Geol.*, **29**, 295–317(1921). —In order to determine exptly. the rate of diffusion in fused rock-forming silicates the following procedure was employed: a layer of diopside was placed in the bottom of a crucible with a layer of plagioclase above it, diffusion was permitted at constant temp. (above the melting temp. of both layers) for a definite period, the charge was quenched and the compn. determined at various depths by measuring the n of the glass. From these expts. it would seem that the movement of large amts. of material through long distances by diffusion can not be credited when the rate at which the magma must cool is considered. On the other hand, diffusion through short distances is possible and such phenomena as the formation of reaction rims about foreign inclusions are to be attributed to diffusion, though for very wide rims (2 m.) a considerable period of time (100 yrs.) will be required. W. F. Hunt (*C. A.*)

22. Kaolin in Belgium. E. Asselberghs. *Ann. Mines Belg.*, **21**, 1059–67(1920); *Rev. geol.*, **1**, 292–93(1920).—Previously known deposits are discussed briefly and a new occurrence is described in detail. The kaolin from Ardenne is shown by a series of analyses to contain but 40% of impurities, which can be removed by levigation, yielding a product capable of competing with those of Devonshire and of Cornwall; the latter in fact has to be sepd. from 75% of impurities. E. T. W. (*C. A.*)

See also No. 25.

Refractories and Furnaces

23. The function of insulation and its application to heat-treating furnaces. E. F. Davis. *Trans. Am. Soc. Steel Treating*, **1**, 33–42(1920).—The requirements of insulators from the viewpoint of efficiency are given. Heat loss from a horizontal surface is 22% greater than from a vertical surface. W. A. Mudge (*C. A.*)

24. Properties and preparation of ceramic insulators for spark plugs. I. Methods of measuring resistance of insulators at high temperatures. F. B. Silsbee and R. K. Honaman. *Nat. Advisory Comm. Aeronautics, Fifth Annual Rept.*, **1919**, 77–89(1921).—Measurements were made at 200°–900° with both a. c. and d. c. at voltages up to 2000. Resistance decreased rapidly with increase in temp. in porcelain, mica, fused SiO_2, and similar materials but there are no sudden changes. A convenient comparison figure is the temp. (T_e) at which the resistivity is 1 megohm per cc. This temp. for various substances is: fused SiO_2, 890°; best porcelain tested, 790°; typical mica plug, 720°; av. of 3 aviation porcelains, 650°; av. automobile porcelains, 490°. In the measurements with d. c., polarization effects disturbed the readings. The mechanism of conduction in this class of materials is exceed-

ingly complex and merits wide investigation. **II. Electrical resistance of various insulating materials at high temperatures.** R. K. Honaman and E. L. Fonseca. *Ibid.*, 91–99.—To obtain reliable findings, tests were made at 550 v., 60 cycle, a. c. Polarization was thus avoided. Cond. increased about 2% per degree. The temp. (T_e), at which resistivity was 1 megohm per cc., varied from 870° for fused quartz to 280° for some kinds of glass. Many findings are recorded. Porcelains developed at the Bureau of Standards showed as high as 800°. Most spark-plug porcelains show about 500°. Any material with T_e less than 400° should be used only when the design of the plug is such that the insulator is very well cooled. **III. Preparation and composition of ceramic bodies for spark-plug insulators.** A. V. Bleininger. *Ibid.*, 101–107.—Spark plugs in airplane engines are subjected to high temps., sudden heating and cooling and mechanical stresses. A suitable material, therefore, must remain a good insulator at the max. temp. reached, not be subject to permanent vol. changes, possess const. thermal expansion and be strong and tough. The best types developed at the Bureau of Standards are given. No. 152 contained: Georgia kaolin, 10; Florida kaolin, 10; N. Car. kaolin, 10; Del. kaolin, 10; Calcine No. 19, 40; Calcine No. 14, 20%. Calcine No. 19 contained: Kaolin, 70.2; Al_2O_3, 27.8; B_2O_3, 2.0%. Calcine No. 14 contained: Kaolin, 56.0; $MgCO_3$ (pptd.), 18.2; potter's flint, 25.8%. Another excellent porcelain was No. 194 containing: Beryl, 35.0; Georgia kaolin, 12.5; Florida kaolin, 12.5; N. Car. kaolin, 12.5; Del. kaolin, 12.5; potter's flint, 15.0%. C. H. Kerr (*C. A.*)

25. An organism producing magnesia. M. Gignoux. *Compt. rend. somm. soc. géol. France*, Feb. 4, **1918**; *Rev. geol.*, **1**, 72(1920).—As bearing on the problem of the origin of dolomite, it is pointed out that there is a very common protozoan, *Trichosphaerium*, the skeleton of which is formed entirely of $MgCO_3$. E. T. W.(*C. A.*)

26. Behavior of clay pyroscopes and fireclay bricks in coal gas. L. Bradshaw and W. Emery. *Gas World*, **74**, 503–504(1921).—From the Report of the Refractory Materials Research Comm. of the Institution of Gas Engineers. Seger cones, when heated in coal gas to temps. well above their ordinary softening points, remained erect. On examn., they were found to consist merely of a hollow shell with a quantity of slag discharged at the base, or of a semi-vitrified mass covered with an infusible skin. The outer shell was extremely refractory. It appeared to be due to the formation of a thin film of hard carbon in intimate contact with the surface of the cone. This effect was found to be due to the decompn. of CH_4 which forms a peculiarly hard and lustrous type of carbon (cf. Bone and Coward, *C. A.*, **2**, 3061). Fireclay brick heated under the same conditions assumed a similar surface deposition. The idea of a protective coating of hard carbon artificially produced on fireclay surfaces might possibly be utilized in gas works practice, as the refractoriness of the shell is very much higher than that of the untreated material. J. L. Wiley (*C. A.*)

27. The vapor pressures of SiO_2, Al_2O_3, CaO and MgO. Otto Ruff and Paul Schmidt. *Z. anorg. allgem. Chem.*, **117**, 172(1921).—This report

presents the results secured using the app. and method described in earlier papers (*Z. anorg. Chem.*, **82,** 373(1913); **106,** 76(1919)).—In certain of the expts. Ar. was used as a furnace atm. and the graphite container was glazed with a mixt. of 3 parts of vanadium carbide and one part of vanadium oxide. The boiling points observed are as follows: Al_2O_3, 2210°; SiO_2, 2230°; CaO, about 2850° and MgO, about 2800°. For the first two oxides linear logarithmic v. p. curves were obtained. It is planned to repeat the work using a tungsten container and an atm. of Ar. E. W. T.

28. Symposium on gas firing. Dr. E. W. Smith and others. *Trans. Ceram. Soc.*, **20,** 20–38(1920).—The cost of mfg. producer gas as compared with coal gas and blue water gas, is in the relative proportion of 3, 4 and 5. Almost any combustible fuel can be employed, providing it is of reasonably constant quality. In most industrial operations, where the gas has not to be distributed, and where the application is sufficiently large to put a producer in the setting of the particular furnace, the internal producer is the cheapest form to run. With an internal producer, it is possible to obtain a hot gas, with an effective c. v. of between 155–160 B. t. u. per cubic foot. Up to 20 percent of heat can be saved by using hot gas in preference to cold. It will pay to sacrifice a little efficiency in gasification, if the labor costs can be reduced considerably. By the adoption of a step grate, clinker troubles will be minimized, but loss of carbon in the ash occurs. By complete gasification of coal it is possible to obtain per ton of fuel about 50,000 ft. of gas of a thermal value of about 360 B. t. u. with inerts of about 6 percent, including the N and the CO_2. The plant is as easy to manipulate as a blue water gas plant; and will use either coke or coal. It will probably never be possible to make gas by means of complete gasification as cheaply as producer gas, and since all industrial operations of any magnitude only require a gas of producer gas quality, producer gas will continue for some time to be the gas that is mainly used. J. Dunnachie.—Gas-firing will save 50% of the fuel that is consumed in a direct-fired kiln, apart from which there is considerable saving also in labor. Gas-firing makes it possible to centralize the work, and obviates the necessity of distributing fuel to, and ashes from, kilns scattered about. The wear and tear on a gas-fired kiln is also considerably less than in the case of a coal-fired one. There is a danger of gas kilns being too elaborate and complicated in the way of flues and dampers. S. T. Wilson.—For goods that require an oxidizing fire and equal temp. gas-firing can only be safely adopted where the gases are so intimately mixed as to produce surface combustion, and if they are burnt in the combustion chamber then they will lose their heat very quickly as they travel across the oven. For this reason the oven must have a very small cross-sectional area, too small for a man to work in but large enough for a tunnel oven. Where the goods to be fired are not injured by contact with the combustible gases or air, then gas can be safely used with recuperation because streams of gas and air can be placed at such an angle that combustion will take place all along its path across the oven and so one end of the flame can be made as hot as the other and consequently

an even temp. can be produced. Large chamber ovens can be used in this case. Col. C. W. Thomas.—The gaseous-fired kiln or furnace is economical because of recuperation or regeneration. It is not so much in the change from solid to gaseous fuel that economy is realized as in the method by which the regenerative system of firing is carried out. For some years Col. T. has had in use an ordinary 28-chamber continuous kiln, coal-fired, burning ordinary firebrick sizes up to 3 and 4 inches thick, to a temp. of cone 9 down; the fuel used has been the ordinary fuel of the S. Staffordshire district, in the form of small nuts. The waste gases have been taken to the chimney at a temp. of from 150° to 200°C, and the consumption of fuel has varied between 2.2 and 1.8 cwts. to the ton of fired material. No figures have been reported for gas-firing which have been lower than those. From the point of view of fuel economy every kiln in which the waste gases are allowed to go to the chimney at anything over 150° or 200°C is sheer waste. Everybody, sooner or later, will have to come, if not to gaseous firing, to recuperative or regenerative firing. H. F. S.

PATENTS

29. Basic refractory material. Harry P. Bassett. U. S. 1,390,328, Sept. 13, 1921. The herein described basic refractory material comprises double burned dolomite, an oxide of a metal of the iron group, an alkali metal compd. and a silicon compd.

30. Acid-proof refractory composition. Harry P. Bassett. U. S. 1,390,-327, Sept. 13, 1921. The herein described acid proof refractory composition comprising silica, a metal comprised within the iron and aluminum groups, an alkali metal coumpound and a silicate binder.

31. Apparatus for heating by combustion without flame. Maurice Mathy. Belgium. U. S. 1,388,355, Aug. 23, 1921. A furnace having one or more of its heating walls in the form of boxes containing a mass of fragmentary porous, refractory material in the heart of which flameless combustion of a gaseous mixt. takes place.

32. Kiln. Harford P. Jenks. U. S. 1,386,116, Aug. 2, 1921. A kiln provided with a perforated floor, a checker-work heat-reservoir located below the floor and adapted to receive the hot gases passing through the perforations of the floor, a down-take located at the edge portion of the reservoir and forming an outlet therefor, and a flue connected with the lower portion of the down-take and having an imperforate upper wall extending along the lower portion of the heat-reservoir, and in contact, throughout its length, with the bottom wall of the reservoir.

33. Tunnel-kiln with sectional combustion-chambers. Philip D'H. Dressler. U. S. 1,384,435, July 12, 1921. In a continuous tunnel kiln, the combination with a kiln chamber having an elongated hot zone, of a plurality of combustion chambers arranged in an end series extending longitudinally of the hot zone and having air and gas inlets at one end and an outlet for products of combustion at the other end and of such proportions that the distance between the inlet and outlet of each chamber is several times the max. transverse dimension of the chamber.

34. Parallel-current calcining-kiln. HARRY E. BROOKBY. U. S. 1,390,335, Sept. 13, 1921. A common direction, parallel current, calcining kiln having a rotary shell, a combustion chamber projecting into the shell, and means for introducing the charge into the shell and passing it over a portion of the surface of the combustion chamber for raising the temp. of the charge and lowering the temp. of the gases of combustion before the two mingle in the shell. C. M. SAEGER, JR.

Whiteware and Porcelain

35. Note on the formation of blow-holes in earthenware glazes. J. BARLOT. AND JH. MARTINET. Univ. of Besançon. *Chimie & industrie*, **5**, 651–52(1921). —The most frequent defects found in the enamel of white panels were due to various impurities (Fe and Cu oxides, dirt from the ovens, etc.) or to excessively large grains in the layer immediately under the enamel. These grains often consist of $CaCO_3$, which causes shallow and irregular holes in the surface of the enamel owing to the liberation of CO_2. Another defect consisted of small round, funnel-shaped cavities, in the bottom of which could nearly always be found a small black particle. Microchem. anal. showed the presence of S by transformation into $CaSO_4$, and also of Fe, which results from the decompn. of FeS_2 into FeS and S. A. P.-C. (*C. A.*)

36. High fire porcelain glazes. H. H. SORTWELL. *Bur. Standards, Tech. Paper*, No. **196**; *This Jour.*, **4**, 718–30(1921). H. F. S.

37. Unestimated losses in pottery manufacture. *Trans. Ceram. Soc.*, **19**, 14–25(1920).—**Works blindness.** J. W. MELLOR.—Works blindness is a kind of disease attended by the blunting of the observational powers due to constant association with a particular works or process.

Recovery of gold residues. C. D. GRIMWADE.—The recovery of the gold is achieved by burning the rags, brushes, and other paraphernalia used by decorators, either in applying gold to ware or in cleaning up and in fusing the ash to a clear glass. A mixt. which has proved very suitable is: Ash 12 oz., borax glass 10 oz., potassium nitrate (nitre) 2 oz. No benefit could be observed from covering the mixt. with a layer of salt.

Wad clay. BERNARD MOORE.—The diff. in the amount of wad clay used between using a wad 0.3 inch and one 0.7 inch, is that the one is more than 5 times the wt. of the other. Within reasonable limits, the less wad clay used, the less dirty ware will the oven yield. In the Research Laboratory at Stoke, square wads are cut the right size to put on the saggars. These are of more uniform texture than squeezed wads. H. F. S.

38. Some new appliances in potting. A. S. W. ODELBERG. *Trans. Ceram. Soc.*, **19**, 42–49(1920).—**Electric carrier.** By means of an electrically operated overhead monorail conveyor, saggars filled with fired ware "wander" quite independently from the oven to the warehouse where they are emptied while in movement by the sorter, without removing of the saggars from the carrier. The saggars when empty return to the placing room near the oven, where they are taken from the carriers at the most convenient spot. A similar

arrangement is used for emptying the glost kiln and taking the goods from the glost warehouse through the other warehouses to the packing shed. The system requires about 50% of the labor formerly employed.

Modification of Schöne's apparatus. A simple app. in which only one can is used and one sepn. made.

Jolleying square dishes. A perfectly rigid jolley is used with all the necessary movement in the jigger head. This is effected by means of a guide plate fixed on the bench. In this guide plate is a groove in which a stud projecting from the jigger head runs dead true. The groove is of very peculiar shape, and has to be determined empirically by reversing the process. The shape wanted is first modeled, and then placed on the jigger head, fitting exactly to the profile of the rigid jolley. Instead of the stud in this case a pencil or needle is fixed to the jigger head, and made to trace the path of the groove on a plaster bat fixed on the bench, simply by turning the jiggerhead so that the mould runs true to the profile. The cast iron guide is then modeled from the plaster bat. It has been found that a man with this machine will make as many articles as with the ordinary oval jigger and jolley, including both flat and hollow ware.

Plate-making machinery. This is constructed according to the latest English pattern with cast iron frames so as to get as much rigidity as possible. The jolley is provided with loose profiles adjustable in the usual manner by means of a nut. The batting machine has a separate frame so as to prevent any jarring in the plate-making machine. It is semi-automatic; the moment the profile is pressed down the jigger head begins to revolve.

Insulators. These are also made by a jigger and jolley instead of by a "monkey." By lengthening the jolley arm and fixing it in an inclined position it is possible to make the profile lift vertically and deliver easily. When the insulators are turned and thoroughly dry, a groove must be made at the top for the wire. The work is accomplished by means of a felt wheel acting like a circular saw and running at 4000 rev. per min. It is partially enclosed in a casing connected with a fan. The groove of the insulator is made in a few seconds, and considerable labor is saved.

Cup and mug handles. These are formed in steel dies heated by an elec. "resistance" fixed inside. The top die is kept somewhat hotter than the bottom one, which facilitates delivery. In this process no oil is needed to make the clay deliver readily from the steel die, and after cooling, the handles are ready to be fixed to the cups.

Heating channels from the ovens. A brick flue (about half a meter square) was built from two ovens. The outlet from the ovens was just over the arch. An extra damper was placed at the top of the cooling cone, and an extra flue provided with a damper was made to connect with the outside air. A motor driven Blackman's fan (70 cm. diam.) was used. After the oven had cooled a little, both the top cone damper and the main flue (bottom) damper were closed, and the motor started. In order that the air should not be so hot as to injure the fan, the shaft or the bearings, the damper of the cold-air flue was

opened in order to bring about a partial cooling. In this way the fan maintained for several days a steady current of air at about 300°C flowing through a drying mangle, and this was quite an efficient subs. for steam. The fan consumed daily 30 to 40 units corresponding to 40 kg. of coal. The boilers consumed 4500 kg. coal, 15% of which amounts to 670 kg. coal, which is the quantity of coal equiv. to the steam formerly consumed in the mangle. Thus at the expense of 40 kg. coal, heat corresponding to 670 kg. coal was obtained. H. F. S.

39. Whiteware glaze defects and their prevention. MAX SCHMIDT. *Keram. Rundschau*, **29**, 341–42, 365–66, 389–90, 412–13, 435–36(1921).—In the prepn. of frits, boric acid is partly volatilized whereby the fluxing effect of this ingredient is partly lost. If S is present in the furnace gases, it combines with the alkalies of the glaze forming a scum known as "gall." During the wet grinding of the glaze these sulphates go into soln. The introduction of kaolin into the frit during the melting process is advizable since this keeps the mass porous, thus promoting oxidation. In the wet grinding of glazes there is a tendency for the glaze to settle and to set similar to cement. This is due to the formation of sodium silicate which causes the cementing. By adding vinegar, dil. HCl, or NH_4 salts, this trouble may be overcome. When this add. is made there is a big increase in vol. due to the formation of silicic acid. To prevent trouble due to this source it is advizable to first add $^1/_3$ of the necessary deflocculent when charging the mill and the other $^2/_3$ after the charge has been ground. The flaking of dry glazes from pottery is due to too fine grinding and too plastic clays. This trouble may be overcome by subs. calcined kaolin for some of the raw clay. It is also advizable to soak the piece with water in order to remove entrapped air from the bisque pottery. The presence of sol. sulphates in clays often causes the dry glaze to scale from the pottery especially along edges. This may be overcome by adding Ba salts to the clay. In firing glazes the soln. of the pottery body by the glazes is an important factor. This often causes the glaze to have a matt appearance. To overcome this the introduction of Al_2O_3 into the glaze is recommended and also more rapid firing during the glost burn. Sulphur in the kiln gases also causes dry spots on glazes and the saggars should therefore be well glazed. Seger's rule which states that crazing may be reduced by subs. a metallic oxide of lower equivalence for one of higher equivalence does not hold true for borax free glazes. Crazing may be reduced by reducing the alkali content, subs. K_2O for Na_2O, or by the subs. of MgO or ZnO for PbO. Too much MgO causes the glaze to become too viscous and too much ZnO causes the glaze to become cryst. H. G. SCHURECHT

40. The perfection of electrical porcelain. THOMSON-HOUSTON, *Le Génie Civil*, **15** (1921); *Tonind. Ztg.*, **45**, 1041(1921).—A process for making elec. porcelain covered by Fr. pat. 506,861, Aug. 31 is described. This process is based upon the fact that the elec. and mechan. props. of porcelains are improved by subs. certain refractory oxides for some of the SiO_2. Not all of the SiO_2 is replaced by the refractory oxides. For ex. a zirkite

body is composed of the following constituents: 81% $ZrSiO_3$, 14% SiO_2 and the remainder TiO_2, Al_2O_3 and Fe_2O_3. TiO_2 and ZrO_2 are especially recommended as subs. for SiO_2. By heating the common porcelain to 800°C and plunging same in water it becomes very friable while the special body is barely affected by this treatment. The tens. strength of the new body is 7400 instead of 4300. The elec. properties of the special porcelain are the same as those of the common porcelain at ordinary temps. At 280°C the special porcelains have a resistance of 2.43 megohms whereas the common elec. porcelains have a resistance of only 0.8 megohm. The special porcelains also have other valuable props. For ex. they are less porous than ordinary porcelains and contain constituents which are more stable than SiO_2 in heating and cooling. H. G. SCHURECHT

41. The use of the Ulbricht sphere in the measurement of reflection and transmission factors. *Bur. Standards, Sci. Paper*, No. **415.** ENOCH KARRER.—A brief historical survey is given of the methods and instruments used in measuring the reflection factor of surfaces. One of the new ways consists in a combination of the sphere with the Martens polarization photometer. The photometer enables a direct comparison to be made between the brightness of the sphere wall and the brightness of the test surface which closes an aperture in the sphere. The sphere wall is illuminated by directing a narrow beam of light through an aperture that is closed by the sample. The sample is illuminated by the sphere wall, but is screened from the direct light from the illuminated spot. The ratio of brightness which is obtained by means of the Martens photometer is exactly the reflection factor of the test surface. Thus the r. f. is determined by one observation without further calcn. and without the use of a standard reflecting surface. This method may be modified so that the transmission factor may likewise be detd. absolutely. A simple and inexpensive reflectometer is also described that may be of service for certain commercial purposes where an accuracy of 10 to 15% is allowable. Some data are given to show that the r. f. of magnesium carbonate in blocks as frequently used in photometry is as high as 98.7%, corroborating some recent detns. by others. The value for magnesium carbonate has until recently been assumed to be 88%. All blocks of magnesium carbonate as ordinarily purchasable have not as high a r. f. They may vary by several percent. H. F. S.

See also No. 24.

Art and Design

42. Art in the pottery industry. (**Symposium on Art.**) G. M. FORSYTH. *Trans. Ceram. Soc.*, **20,** 2–7(1920).—The word "Art" is used to signify work evincing practical skill in the creation of beauty. "The application of living healthy artistic ideals to pottery manuf. means the soundest economy, and is essentially a business proposition, for the designer or the artist has the last word in production, and the effect of his work is first to sell the goods. It means that good workmanship replaces bad, and that common-

sense beauty replaces extravagant ugliness wherever it exists in any grade of ware for any market in the world. There is today an incessant and increasing demand for well-decorated pottery of a purely utilitarian type." "We deliberately degrade our craft, and then moan about it, saying that we have no skilled men, or we take refuge in saying that 'This is what the public wants,' pure humbug and subterfuge." "It (Art) is the bride of the ages, elusive, forever beautiful, and gifted with eternal youth." H. F. S.

43. A plea for toleration in Art. (Symposium on Art). J. W. MELLOR. *Trans. Ceram. Soc.*, **20**, 11–19(1920).—

> Myself when young did eagerly frequent
> Doctor and saint, and heard great argument
> About it and about; but evermore
> Came out by the same door, where in I went.
> —*Omar Khayyam.*

"There are fashions in Art. Custom will make us satisfied with one fashion until a new one appears. A dream of a hat one season may, the following season, be an ugly nightmare. In countries where men's faces are bare, men with beards are regarded as horrors. The practices of certain nations tattooing the body, painting the skin, putting skewers through the nose or lips, elongating the skull, or distorting the feet, are not regarded as deformities, but are presumably intended to enhance the beauty of the human form. The Hottentots can perceive more loveliness in their—to us—ugly Venus than in the—to us—beautiful Grecian Venus of Melos. Thus a design may be regarded as beautiful in one country, and hideous in another. There are designs which to us are beautiful and artistic which are blasphemous and ugly to another nation. The canons of Art are very different with different peoples; and perhaps to a less extent with the same peoples trained in different schools of Art. Certain charms in a woman may attract one man and not another; one man marries a drooping eyelid, another a dimpled chin, another a supple waist, and still another a bewitching ankle. The standard of Art or beauty varies with the individual's temperament; it varies with a nation's customs, traditions and habits; and it varies with time, and changes with the prevailing fashion." "When a man claims that 'the public taste wants educating,' I understand him to mean that the public taste differs from his own, and that he would like some missionary work done to try and get their standards in harmony with his own. I deny the right of any man to say that an object beautiful to me is ugly in the abstract, though it may be ugly enough to him. In Art and Politics I am a strong Individualist—*quot homines, tot sententiae*, so many men, so many minds." "Our descriptions of colour are very shocking. A man cannot be frightened as 'white as a ghost,' but his bloodless skin may appear dirty yellow. We say that a girl has sky-blue eyes, when they are really the colour of slate; that she has 'ruby lips' or 'cherry lips,' when they are really the colour of Accrington facing bricks; and that her skin is 'white like the hawthorn buds that open in the month of May' when the real colour is not unlike that of a Swede turnip." H. F. S.

44. Pottery design from the manufacturer's point of view. (Symposium on Art). H. J. PLANT. *Trans. Ceram. Soc.*, **20,** 8–10(1920).—The potter is no powerful enough to sway the nation's fancy. "The most successful designer is he who keeps well in touch, and is ever playing up to the public, following every fickle fancy, and working every craze to his utmost capacity. This requires breadth of conception. The man with fixed ideas is incapable of producing patterns to suit all markets, not that he must be willing to produce designs having no artistic merit, but that his designs must be beautiful in a way that will appeal to the people for whom they are made." "Certain designs produced by a capable man were approved at the Ceramic Society's adjudication last year, but knowing from experience the public taste, another range of samples was made, and both lots put on the market together, with very discouraging results to the adjudicators' approved works. The patterns done to suit the market had a far greater sale than the conventional art designs. The prices of both lots were very similar. The kinds of work very much appreciated throughout the country were borders with naturalistic rose sprays tastily displayed underneath, also roses with narrow brown borders underneath, festoons, scattered flowers, flowers connected by choice bits of ornament, and various other styles suitably colored to meet the present day fancy." H. F. S.

Heavy Clay Products

PATENTS

45. Black tile. TATSUZÔ SHIMOSE. Japan 36,725, July 6, 1920. A mixt. of 60% graphite and 40% fire-proof clay is made to a paste with H_2O, painted on common tile and fired in a kiln to produce fire-proof black tile. (*C. A.*)

46. Material for and process of forming brick, tile, and the like. LLEWELLYN JONES AND CHARLES WESTLAKE, JR. U. S. 1,390,038, Sept. 6, 1921. A material for dry pressing in the formation of brick, tile and the like, containing silica from 65 to 75%, lime from 20 to 30% magnesia from $1^1/_2$ to $3^1/_2$ and sulphur from $1^1/_2$ to $3^1/_2$%.

47. A machine for producing hollow bricks. BROR OSCAR WALTER HESSELMAN AND OSKAR GOTTFRID MEINHARD. Stockholm, Sweden. U. S. 1,386,404, Aug. 2, 1921. In a machine for molding blocks, the combination of a mold, a support, means for moving the mold into operative position at one side of the support and into inoperative position away from the support, means for applying pressure to the material in the mold and means for automatically relieving the pressure when the mold reaches its inoperative position.

48. Brick-kiln construction. JAMES T. POKORNY. U. S. 1,386,530, Aug. 2, 1921. A brick mfg. plant, a fire chamber, drying and firing chambers arranged in superimposed relation above the fire chamber, the floor of the drying chamber having opening therein to admit the heated air circulating about the exterior of the fire chamber, and fuel conducting pipes connecting the firing room with the fire chamber.

49. Apparatus for the manufacture of bricks or building blocks. EDMOND LECHAT. Nantes, France. U. S. 1,383,131, June 28, 1921. A feeding app. for brick- or building-block presses, comprising in combination upper troughs containing the concrete used to form the main body or core of the brick or block, lower troughs containing the concrete used to form a facing upon one or more sides of the brick or block, endless aprons constituting the movable bottom of the distributing troughs, each trough being provided with adjustable shutters, spouts vertically moved extending through an opening into the mold of the press, a series of feeding chutes leading the first of the qualities of concrete into the spouts and another series of feeding chutes leading the second of the qualities of concrete around the spouts.

50. Building brick. JAMES P. WILLIAMS. U. S. 1,385,961, July 26, 1921. A building brick comprising side load-sustaining members, hollow throughout their length to provide longitudinal air-cells; a central load-sustaining member of approx. the same dimensions as the side members and also provided with a longitudinally-extending air-cell; there being at least three of such air-cells in the brick; and solid webs connecting the central load-sustaining member with each of the side members and extending in horizontal planes from the central member approx. midway of its top and bottom portions; the upper and lower faces of each of the side members being in the same plane; the side members being in balanced relation to the central member; the central member presenting two oppositely-disposed hand-holds, whereby the brick is rendered reversible and adapted to be gripped at either side; and there being between the central member a mortar joint-breaking channel having right angularly formed walls.

51. Brick or building block. JEAN E. KEIFER. Lausanne, Switzerland, U. S. 1,382,652, June 28, 1921. Hollow half bricks or building blocks having sides of equal length and so shaped that when the equal sides are placed together they form a brick or block having at least one face or side shaped as an S with equal limbs.

52. Process of manufacturing and handling brick. GRAFTON E. LUCE. U. S. 1,384,393, July 12, 1921. The process of handling articles during their continuous travel, which consists in moving a carrier against their line of travel, engaging the articles and then retracting the carrier at a speed equal to or greater than the travel of the articles.

53. Revolving crane for brick handling. GRAFTON E. LUCE. U. S. 1,384,768, July 19, 1921. App. of the kind described comprising a rotatably mounted table, a carriage mounted for forward and backward movement thereon, a boom carried by the carriage, a frame suspended from the boom, and links connecting the frame and the carriage to maintain the same parallel to each other.

54. Fire-brick trimming or beveling machine. FRANK WIERZBOWSKI. U. S. 1,383,686, July 5, 1921. In a brick-trimming machine of the class described, a carriage adapted to have a grinding or dressing stone clamped therein, means to horizontally reciprocate the carriage, a brick-supporting

pallet, means to elevate the pallet to engage the upper surface of the brick thereon with the stone carried by the carriage, means to adjust the pallet at an angle to the horizontal whereby beveling of the brick may be had, the last named means including a vertically movable standard having a spider fastened upon the upper end thereof, and set screws threaded upward through the spider in supporting engagement with the under surface of the pallet.

C. M. SAEGER, JR.

Glass

55. The relation between the density and chemical composition of glasses. SA. *Keram. Rundschau,* **29,** 366–67, 390–91(1921).—The d. of glasses may be calc. from their chem. anal. and d. factors as follows:

$$\frac{a}{A} - \frac{b}{B} - \frac{c}{C} - \ldots\ldots\ldots - \frac{n}{N} = \frac{S}{X}$$

a, b, c ..... n are the percents of these constituents in glass, A, B, C ..... N are the factors for the different oxides and X is the d. of the glass. The d. factors are not the same as the d. of the uncombined oxides, this being especially true with Al_2O_3 and Sb_2O_3. The ds. of the same glass may vary 2% according to the method of manuf. In CaO–MgO–SiO_2 glasses the d. factor for MgO is higher while, in Na_2O–MgO–SiO_2 glasses it is lower than the d. of the pure oxide. The true ds. and the d. factors for different oxides in glass are given below:

			Density Factor in Glass		
Oxide	Density		Winkelmann	Tillotson	Baillie
SiO_2	2.22	Deville 1855	2.3	2.3	2.24
Al_2O_3	3.85	Rammelsberg	4.1	2.75	2.75
Sb_2O_3	6.69	...	...	...	3.00
B_2O_3	1.79	Clarke	1.9	2.24	2.90
As_2O_3	3.74	...	4.1	(4.1)	3.33
ZnO	5.65	Schröder	5.9	5.9	5.94
BaO	5.00	Clarke	7.0	7.0	7.20
CaO	3.30	Moissan	3.3	4.1	4.30
MgO	3.60	Clarke & Moissan	3.8	4.0	3.25
PbO	9.30	Clarke	9.6	9.6	10.30
K_2O	2.66	...	2.8	(2.8)	3.20
Na_2O	2.55	...	2.6	2.8	3.20

H. G. SCHURECHT

56. Progress in manufacturing radio-protective glasses. W. W. COBLENTZ. *Optician,* **58,** 265(1920); *J. Soc. Glass Tech.,* **4,** 27.

H. G. (*C. A.*)

57. Synthetic helium and neon. A. LO SURDO. *Atti accad. Lincei* [v], **30,** i, 85–88(1921).—L. finds that Ne, He, and H are able to pass through *hot glass,* the H in far greater quantity than the other two gases. The passage is dependent on the temp., nature, and thickness of the glass. These results may furnish an explanation for the origin of so-called synthetic He and Ne, which may be derived from the atm. J. C. S. (*C. A.*)

58. Electric load conditions in the glass industry. C. W. FICK. *Gen. Elec. Rev.,* **24,** 539–42(1921); illus.—Includes a brief account of modern plate-glass manuf. C. G. F. (*C. A.*)

59. Nomenclature of glass. C. J. Peddle. *J. Soc. Glass Tech.*, **17**, 3–15(1921).—*A plea for standardization* international if possible, of glass nomenclature. At present there is much confusion because of overlapping of trade names and technical terminology. A *set of rules is suggested* for a standard nomenclature which specifies the constituents. In the case of optical glass it is suggested that the main classes be subdivided according to the refractive index for the D lines instead of according to d.

W. C. Taylor

60. Comparison of the alkali-lime-silica and the alkali-lead oxide-silica glasses. Part X of "The Development of Various Types of Glass." C. J. Peddle. *J. Soc. Glass Tech.*, **17**, 72–106(1921).—Several series of glasses were prepared and studied containing (1) 20 or 40 mol. of Na_2O or K_2O and 5 to 40 mol. of CaO or PbO or a mixt. of the two, to 100 mol. of SiO_2, and (2) 10 to 25 percent of Na_2O or K_2O and 5 to 20 percent of CaO or 5 to 30 percent of PbO and 60 to 70 percent of SiO_2. The *density and total dispersion* are higher for lead than for the corresponding lime glasses of corresponding mol. or percentage compns. and the *refractive index* is higher in lead glasses of the same mol. compn., but not as high as lime glasses of the same percentage compn. except when the SiO_2 content is under 60 percent and at the same time the alkali content greater than 20 percent. Also the lead glasses show a relatively greater dispersion toward the blue end as compared with the red end than corresponding lime glasses. Lime glasses are more prone to *devitrification* than lead glasses, particularly if they contain soda, but their *soly.* is less weight for weight and also when compared molecularly unless the alkali content is under 15 percent. For lime and particularly for lead glasses with an alkali content less than 20 percent, glasses containing equal weights of Na_2O and K_2O are less sol. than corresponding glasses containing only one alkali. The *weathering* results are very similar to those for soly.

W. C. Taylor

61. Influence of aluminum on the working properties of glass. Violet Dimbleby, F. W. Hodkin and W. E. S. Turner. *J. Soc. Glass Tech.*, **17**, 107–115(1921).—Two series of glasses were prepared, (1) $6SiO_2$, xNa_2O, yAl_2O_3 where $x+y=2$, and (2) $6SiO_2$, $1.1Na_2O$, $xCaO$, yAl_2O_3 where $x+y=0.9$. With temp. of 1400–1425°C the authors were unable to melt and plane a glass containing above 13 percent Al_2O_3 in the first series and 7.5 percent Al_2O_3 in the second; yet in the latter series small amts. of Al_2O_3 rendered the soda-lime glass more readily fusible. In the first series, increasing the alumina rapidly increases the *viscosity and toughness* and its tendency to acquire a hard skin on marvering. But alumina was found very favorable to easy *manipulation in lamp working* and also of value in preventing *devitrification*. The *thermal conductivity* seemed to decrease as the alumina content increased.

W. C. Taylor

62. Effect of aluminum on the annealing temperature of glass. S. English and W. E. S. Turner. *J. Soc. Glass Tech.*, **17**, 115–18(1921).—The annealing temp. was determined by the optical method for the two

series of glasses described in the preceding abstract, with the conclusion that *when replacing magnesium or calcium* mol. for mol. and also g. for g., aluminum reduces the annealing temp. in most cases. G. S. FULCHER

63. Some optical properties of the sodium-aluminium tri-silicate glasses. J. R. CLARKE AND W. E. S. TURNER. *J. Soc. Glass Tech.*, **17**, 119–20(1921). —Data are given for the *refractive index and dispersion* of four glasses with the compn. $6SiO_2$, xNa_2O, yAl_2O_3 where $x+y=2$ and the alumina was varied up to 9 percent. The index increases with the d. but not so fast, whereas the dispersion increases faster. G. S. FULCHER

64. Effect of sodium oxide on the thermal expansion of sodium silicate glasses. S. ENGLISH AND W. E. S. TURNER. *J. Soc. Glass Tech.*, **17**, 121–23. (1921).—The *expansion* coeff. for seven sodium silicate glasses with silica content of from 67 to 83 per cent were detd. The results correspond to the equation: $\alpha \times 10^8 = 5.0 + 4.20N - .0002N^3$ where N is the percent Na_2O. Taking the factor for 1 percent silica as 0.05×10^{-6}, the factor for Na_2O is 4.25×10^{-6}. For cubical expansion the corresponding factors come out 0.15 and 12.75 instead of 0.8 and 10.0 as given by Schott. The value for Na_2O agrees well with that previously obtained from sodium-calcium glasses, 12.96. G. S. FULCHER

PATENTS

65. Drawing and painting glass. ANSON K. CROSS. U. S. 1,387,439, Aug. 9, 1921. A painting corrector comprising a spirit level and means for producing side by side two blurred images, one of the subject and the other of its representation, and a frame in which the elements are so mounted that the spirit level indicates the correct leveling of both the frame and the image-producing means.

66. Automobile-headlight glass. WILLIAM G. SCHNEIDER. U. S. 1,391,511, Sept. 20, 1921. A headlight glass of the character described, comprising a glass plate having series of undulations over the entire surface of one side thereof, and having outwardly rounded, raised portions forming a spotted arrangement over the entire surface of the opposite side, the cross sectional width of the undulations being greater than the cross sectional width of the rounded raised portions, and the border of the glass being of less translucent character than the central portion of the glass.

67. Lens-cutting machine. WALTER W. SLADE. U. S. 1,388,774, Aug. 23, 1921. A lens-cutting machine of the kind described, comprising a swinging support for the cutter, adapted to be held under spring tension toward the work to be operated on, and a lever operable to move the work holder out of operative position.

68. Abrasive for grinding and smoothing glass. WILLIAM L. KANN. U. S. 1,387,649, Aug. 16, 1921. The method of grinding, smoothing and finishing glass preparatory to polishing, comprising supplying to the glass a natural cryst. abrasive of such character that as it is crushed and broken the

smaller grains and particles thereby produced are of distinct cryst. form, and continuously collecting and supplying to the glass such abrasive during the grinding, smoothing and finishing operations.

69. Glass-discharging mechanism. EDWARD S. HUTTON. U. S. 1,391,957, Sept. 27, 1921. Discharge means for a glass tank, including a discharge member adapted to extend through the wall of the glass tank and beyond the inner and outer surfaces thereof and having a glass conduit leading from the bottom of the inner end of the member upward and thence horizontally to the outer end of the member and thence upward to a point slightly above the normal level of the glass in the tank and thence downward to the discharge outlet, and an air conduit leading from the outer end of the member horizontally to the inner portion of the glass conduit and means for introducing air under pressure in the air conduit.

70. Sheet-glass-drawing machine. CLARENCE A. RHONEMUS. U. S. 1,391,405, Sept. 20, 1921. In a sheet-glass drawing mechanism, the combination of a pot containing a mass of molten glass and having oppositely-disposed discharge portions below the glass level, and vertically moving, longitudinally-slotted tubes having transverse openings therein, with transverse glass scoring mechanism entering the opening, and logitudinal glass scoring devices.

71. Sheet-glass-drawing apparatus. CLARENCE A. RHONEMUS. U. S. 1,391,406, Sept. 20, 1921. In a sheet-drawing app., a receptacle for molten glass from which the sheet is drawn, a cooler for the sheet adjacent the drawing point, gaseous heating means above the molten glass for heating the surface glass, and a shield between the heating means and the glass, transmitting the heat downward therethrough, but preventing direct contact of the hot glass with the cooler.

72. Method of making bifocal lenses. HENRY A. SCHEUERLE. U. S. 1,383,863, July 5, 1921. The method of making bifocal lenses which consists in rotating the blank to be abraded, with the minor area at the axial region thereof and the major area at the distal region thereof, while rotating abrading means contiguous to the major area in an annulus encircling the axis of rotation of the blank but eccentric to that axis; and preventing any change in the direction of the respective axes during the abrading operation; and thereby preventing abrasion of the axial, minor region of the blank while circularly abrading an annular, major region of the blank concentric with the axis of rotation of the blank but eccentric to the axis of rotation of the abrading means.

73. Frosted glass and process for making same. CHARLES F. LORENZ. U. S. 1,386,880, Aug. 9, 1921. The process of finishing a glass surface which consists in sand-blasting the glass surface and afterward rubbing the surface with an abrasive.

74. Apparatus for drawing sheet-glass. THOMAS S. OWENS. U. S. 1,386,-724, Aug. 9, 1921. In a continuous sheet-glass drawing app., two sheet drawing units disposed in opposite relation at opposite sides of a sheet being drawn, each of the units comprising shafts transversely spaced longitudinally

of the sheet, sprocket wheels carried by each shaft, a pair of sprocket chains connecting the wheels and spaced longitudinally of the shafts, and sheet engaging bars connecting the chains and spaced longitudinally thereof to provide a considerable space between the points of engagement of a sheet by the bars, the bars of one unit coöperating with those of the other unit to grip and impart drawing movements to the engaged sheet, the bars of the separate units also coöperating to score and weaken the engaged sheet at the points of gripping of the same.

75. Means and method for producing charges of molten glass. CLYDE R. LOTT. U. S. 1,382,993, June 28, 1921. The method of feeding molten glass, which consists in intermittently delivering from a tank to a container exterior thereto, predetermined quantities of molten glass, causing the same to be intermittently discharged downward from the container through an outlet orifice and subjecting the discharged glass to the action of a mech. shearing means spaced below the oriface whereby mold charges are formed.

76. Production of bores in glass. JOSEPH KENT. Maldon, England. U. S. 1,382,650, June 28, 1921. The method of manuf. glass tubing, which consists in incorporating with a mass of glass a sealed length of glass tubing, and thereafter drawing out the piece thus constituted until it is reduced to the required cross sectional dimensions.

77. Apparatus for sawing glass. WILLIAM TAYLOR. England. U. S. 1,385,731, July 26, 1921. App. for sawing glass, which comprises in combination a saw, a work holder for supporting the glass to be sawed, means by which one of the members tends to move to cause a relative approaching movement between the glass and the saw with a force sufficient to effect the approaching movement at the desired rate when the saw is in proper working condition but not sufficient to damage the saw or the glass when the saw is blunt, and means for limiting such approaching movement to a predetermined rate slightly less than that which would normally overload the saw.

78. Machine for making glass bottles. CHARLES F. COX. U. S. 1,385,428, July 26, 1921. In a bottle-making machine, an inverted mold for receiving the molten glass, shears above the mold for removing the excess glass, a downwardly movable plunger provided with a bottom finishing head, means for operating the shears, and means controlled by the shear operating means for both operating the plunger and rotating the neck-finishing head.

79. Mechanism for shifting plate-glass and grinding tables. FRANK E. TROUTMAN. U. S. 1,385,852, July 26, 1921. In app. for shifting plate-glass grinding tables, the combination of a suitable track, a grinding table, wheels on the table adapted to engage the track, means for disengaging the wheels from the track, a high-power elec. motor, a shaft driven thereby at relatively high speed, connections between the shaft and the table for rotating the same, a low power elec. motor, a shaft driven thereby at relatively low speed, and a magnetic clutch between the first-named shaft and the last-named shaft, the clutch being energized when the low power motor is started, whereby, when the low-power motor is put into operation, the magnetic

clutch is automatically operated to connect the shafts when the first-named motor is idle.

80. Glass pavement-light. FREDERICK L. KEPPLER. U. S. 1,385,688, July 26, 1921. As a new article of manuf., a tile unit comprising a glass body with a substantially flat upper surface, a depending rim about its edge, a plurality of projections from the lower surface of the tile, within the rim, shaped to form strengthening and light diffusing areas, and a series of abrasive plugs set in the upper surface of the tile above the projections, each plug lying well within the boundary of the projections over which it is placed.

81. Apparatus for grinding and polishing plate-glass. FRANK EDWIN SLOCOMBE. England. U. S. 1,384,278, July 12, 1921. In a sucker device, adapted to hold glass on to a grinding or polishing table the combination with a sucker movable relatively to the table and to which the glass is attached by atmospheric pressure, of pneumatic means operatively connected to the sucker for allowing the glass to be pressed against the table by atmospheric pressure, the relative areas of the glass and pneumatic means which are subjected to the said pressure being such that, of the total atmospheric pressure on the glass due to whatever degree of vacuum there may be in the sucker device, a portion determined by the dimensions of the latter operates to press the glass on to the table while the remainder presses the glass on to the sucker.

82. Apparatus for the manufacture of glassware. WILLIAM H. MCSWAIN. U. S. 1,384,967, July 19, 1921. An app. for the manuf. of pressed articles of glassware, comprising a platform, an endless carrier arranged for continuous travel over the platform, a plurality of molds borne by the carrier at regular intervals, a press disposed over the path of travel of the molds, the press being arranged to advance successively with the molds throughout a definite distance, means actuated during forward travel of the press for reciprocating the plunger of the latter with respect to an underlying mold for shaping the ware, and a glazing oven through which the molds travel following the ware-shaping operation.

83. Glass-tank furnace. JOSEPH E. HURLEY. U. S. 1,390,614, Sept. 13, 1921. A glass-tank furnace, comprising tanks forming the walls thereof, means for supplying water to the tanks, a fibrous facing on the inner walls of the tank, and a passage formed between the walls of the tank and the facing, the passage communicating with the tank.

84. Glassware-machine. EDMA H. CURTIS, JR. U. S. 1,386,240, Aug. 2, 1921. In a leer, the combination with interspaced fixed and movable supports for glassware in the leer, and a conveyer member having fixed supports corresponding to the fixed supports of the leer, of a driving member common to the movable supports and the conveyer, and adapted to move the movable supports to unload the conveyer member and to move the conveyer member into and out of the leer, the driving member timed to thrust forward the movable supports after the conveyer member is in place in the leer, then lift the supports, then withdraw the supports, and then move the conveyer member out of the leer.

85. Apparatus for drawing glass cylinders. ARTHUR E. SPINASSE. U. S. 1,386,441, Aug. 2, 1921. In an app. for drawing glass cylinders, a furnace, a forehearth extending from the furnace, a wall between the two, a recess in the wall and cooling means in the recess, a cover for the forehearth having an opening therein, a ring in the opening, a support for the ring, the support extending under the ring, means for raising and lowering the support and ring, and a glass segregating element adapted to float in the glass in the forehearth and to rise into contact with the ring support without adhesion.

86. Glass construction unit. FREDERICK L. KEPPLER. U. S. 1,386,409, Aug. 2, 1921. A new article of manuf. A glass tile comprising a relatively thin portion, downwardly depending edges having corrugated outer surfaces, a band of cement material let into the corrugations, the outer surface of the band being channeled. C. M. SAEGER, JR.

See also No. 24.

Cement, Lime and Plaster

87. Transformation of light magnesia into the dense form. N. PARRAVANO AND C. MAZZETTI. *Atti accad. Lincei*, **30**, i, 63–66(1921).—The results of the authors' expts. show that the velocity of hydration of MgO diminishes as the temp. and duration of its previous calcination are increased, no discontinuity being observable. The statement that MgO undergoes transformation at about 1600° (Le Chatelier, *Le Chauffage*, 399) or 1100° (Campbell, *C. A.*, **12**, 268) is inaccurate, this change having already begun at the lowest temp. employed by the authors, namely 800°, at which, however, it proceeds very slowly. This result is confirmed by Ditte's measurements of the d. of the oxide after being heated at definite temps. for a certain time (*J. Chem. Soc.*, **24**, 869(1871)). Natural magnesites contain impurities which exert a marked influence on the velocity of hydration of the oxide resulting from their calcination, the transformation into the dense modification being facilitated. This change is at first slow and continually increases in rapidity as the temp. is raised, and no definite transformation temp. probably exists.

J. C. S. (*C. A.*)

88. Special ferriferous agglomerate and its applications in presence of pozzuolanous substances. FABIO FERRARI. *Giorn. chim. ind. applicata*, **3**, 53–56(1921).—The ferriferous agglomerate had the following compn.: SiO_2 = 24.04%, insol. siliceous residue = 0.28, Al_2O_3 = 3.32, Fe_2O_3 = 5.24, CaO = 65.10, MgO = 0.47, SO_3 = 0.61, alkali (not detd.) = 0.94. F. drew the following conclusions from this study: (1) Cements of this type, in which the sesquioxides stand in equiv. relations, are free from binary combinations of these sesquioxides. They are, therefore, stable towards the action of sulphates and chlorides. Since the greatest fusibility of the material forming the second consolidation of the clinkers corresponds to the existence of the above mentioned equiv. proportions, the above type of cements may be regarded as products showing the easiest scorification and containing the greatest amounts of hydraulics (Ca silicates). They may, therefore, be substituted in all

applications, not only of ferroportlands, but also of ordinary Portlands. (2) Pozzuolanous substances added to the above type of cements moderate their high basicity and fit them for mortars of the highest permeability. These mixts. also possess a mechanical resistance greater than mortars of ordinary Portlands in general use. ROBERT S. POSMONTIER (*C. A.*)

89. Electrified cement industry. LLOYD W. CHAPMAN. *J. Elec. Western Ind.*, **47**, 7–9(1921).—The method of manuf. Portland cement at the Santa Cruz Portland Cement Co. is briefly described with 5 illustrations. About 60% of the K_2O that enters the plant is recovered. The product contains about 33% K_2O, is completely sol. in water and is very suitable for fertilizers, being free from any injurious impurities. The K is recovered from the dust by a Cottrell precipitator. C. G. F. (*C. A.*)

90. Law governing the hardening of cement. J. BIED AND E. GARNIER. *Rev. ing. index tech.*, **28**, 269–72(1921).—The tensile strength of cement after 84 days can be calcd. from the strengths at 7 and 28 days from the formula $R_{84}=K(2R_{28}-R_7)$ where K is a const. which is very near 1 for all except quick-setting cements. Hence the hardening equation is hyperbolic and is $(t-3.6)(h-2.7)=152$ for cements and $(t-8.5)(h-8.7)=429$ for limes, where t is the time (the meaning of h is not given). Calcd. and detd. values are given for 2 samples and show very close agreement. A. P.-C. (*C. A.*)

91. The physical properties of magnesia cement and magnesia cement compounds. R. J. ROARK. *Bull. Univ. Wis. Eng. Series*, **8**, No. 5, 257–331 (1917); *Expt. Sta. Record* **43**, 282.—This bulletin presents the results of an exptl. study of the physical properties of magnesia cement and magnesia cement compds. and of the factors affecting these properties. An important object of the investigation was the detn. of physical tests which could be relied upon to indicate the suitability or unsuitability of particular cements or compds. for use as flooring material. A description of magnesia cement, its manuf. and uses, is given, together with a summary of the results of chem. investigations. H. G. (*C. A.*)

92. Lime kilns and lime burning. RICHARD K. MEADE. *Sugar*, **23**, 264–66 (1921).—The various types of lime kilns are described. A water-jacketed cooling cone gives longer service. Reinforced concrete was used to replace the steel jacket for the kiln with excellent results. Relative values of fuels are summarized: one ton bituminous coal hand-fired 3.5–4 tons lime; one ton coal fired as producer gas burns 3.5–5 tons lime; 1 bbl. oil fires 1–1.75 tons lime; 1 cord wood fires 2.25–2.75 tons lime. C. H CHRISTMAN (*C. A.*)

93. The equilibrium between Portland cement and limewater. RICHARD LORENZ & GUSTAV HAEGERMANN. *Z. anorg. allgem. Chem.*, **118**, 193(1921).—The material for expt. was prepd. by mixing with 12% H_2O, and compressing and ageing 28 days over H_2O and 7 days in a desiccator. It was then ground and screened through 180 and 220 mesh sieves and again stored over H_2O for two months. Samples of 0.5 to 4 grm. were stirred rapidly into 500 cc. H_2O in a Jena flask kept at constant temp. and stirred continuously. CaO was detd. in the filtrate. The rate of soln. of CaO increased regularly with

fineness and with temp. but irregularly with time. The first rapid soln. was followed by a period in which the CaO in soln. was constant: then the amt. of CaO in soln. increased asymptotically to a constant value. The same shape of curve was obtained repeatedly by treating with fresh portions of H_2O as long as any of the original clinker remained. The final insol. portion after all CaO had been leached out was gelatinous $SiO_2 + Al_2O_3$. The expt. data are interpretive as follows; First CaO is dissolved leaving $SiO_2 + Al_2O_3$. When the $Ca(OH)_2$ in soln. reaches a certain concn. it is adsorbed by the colloidal $SiO_2+Al_2O_3$ during which period the $Ca(OH)_2$ in soln. remains const. When the gel is "saturated" the concn. of $Ca(OH)_2$ again increases. By repeating the treatment with fresh portions of H_2O until no clinker remained the distribution coeff., $\frac{\text{CaO adsorbed}}{\text{CaO in solution}}$ was found to approach a value of about 7. The author considers that these findings have an important bearing on the use of cement in contact with ground waters, sea waters, etc.

E. W. T.

PATENTS

94. Magnesia plaster. Shôzaburô Mimura and Rokusaburô Yamamoto. Japan 36,733, July 8, 1920. Lower coating: A mixt. of 5% saw dust, 10% asbestos and 40% MgO is made to a paste with 44% $MgCl_2$ in 2–3% Pb acetate soln. Upper coating: A mixt. of 40% MgO, 5% powdered peanut husks, 10% asbestos and 5% pigment is made to a paste by the same $MgCl_2$ soln. in Pb acetate soln. The plaster is antiseptic and odorless. (*C. A.*)

95. Plastic composition for bricks. John Smith. U. S. 1,385,757, July 26, 1921. A plastic compn. comprising cement, coal ashes and brick dust of substantially equal proportions. C. M. Saeger, Jr.

BOOK REVIEWS

A discussion of the making of reflecting surfaces. Held on Nov. 26, 1920 at the Imperial College of Science and Technology, South Kensington, S. W. 7, England. Price 5s. 6d. sent to The Optical Society at the above address. This booklet is a collection of the following papers ending with a general discussion. 1. Survey of the Bibliography of Metallic Deposition on Glass. By R. Kanthack. 2. A Bibliography of the more important Papers on the Construction and Nature of Reflecting Surfaces. By R. Kanthack. 3. Notes on the Formaldehyde Process of Silvering. By H. N. Irving. 4. Some Workshop Notes on Silvering. By James Weir French, D.Sc. (Messrs. Barr & Stroud, Ltd., Glasgow). 5. The Silvering of Glass Reflectors by Chemical Deposition. By F. Ellerman and H. D. Babcock (Mount Wilson Observatory). 6. The Silvering of a Large Reflector. By C. R. Davidson (Royal Observatory). 7. Note on the Silvering of Quartz and Glass Fibres. By R. S. Whipple, M. I. E. E. (The Cambridge and Paul Instrument Co., Ltd.). 8. Some Notes on Mirrors Used for Reflecting Heat Radiation. By Prof. Chas. Féry (École Municipale de Physique et de Chimie, Paris). 9.

Deposition of Metals by Cathodic Spluttering in Vacuo By F. Ellerman and H. D. Babcock (Mount Wilson Observatory). 10. Note on the Production of Mirrors by Cathodic Bombardment. By F. Simeon, B.Sc., F. Inst. P. (Messrs. Adam Hilger, Ltd.). 11. Platinum Reflecting Surfaces Prepared by the "Burning-in" Process. By Julius Rheinberg, F. R. M. S., F. R. P. S. 12. A Note on Mirrors for use in Optical Instruments under Industrial Conditions By W. G. Collins (The Cambridge and Paul Instrument Co. Ltd.). 13. A Photometric Method of Measuring the Reflecting Power of Mirrors. By John W. T. Walsh, M.A., M.Sc. (The National Physical Laboratory). 14. General Discussion.

Vol. 1 FEBRUARY, 1922 No. 2

Ceramic Abstracts

EDWARD W. WASHBURN, Editor
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ABSTRACTORS: E. N. BUNTING, W. M. CLARK, G. S. FULCHER, S. L. GALPIN, SEIJI KONDO, A. T. MALM, R. J. MONTGOMERY, LOUIS NAVIAS, C. W. PARMELEE, C. M. SAEGER, JR., H. G. SCHURECHT, R. B. SOSMAN, H. F. STALEY, E. W. TILLOTSON.

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[1] The abbreviation (*C. A.*) at the end of an abstract, indicates that the abstract was secured from the Editor of *Chemical Abstracts* by coöperative agreement.

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General and Miscellaneous

1. The utilization of red slime. OSKAR LECHER. *Tonind. Ztg.*, **45,** 1023(1921).—In the manuf. of $Al(OH)_3$, bauxite is mixed with a soln. of NaOH and heated to 160–170°C in an autoclave under a pressure of 3–4 atms. or is fused with soda. In each case an easily sol. $Na_3Al_2O_3$ is formed which is removed by filtration. A red slime containing Fe_2O_3, SiO_2, TiO_2 and MgO remains in the filter press and is very abundant as a by-product. In one case this slime had the following compn.: H_2O 7.8%, loss on ignit. 12.3%, SiO_2 11.0%, Fe_2O_3 50.9%, CaO 8.2%, MgO tr. and TiO_2 0.23%. This material has been successfully substituted for Fe_2O_3 as a coloring oxide in glazes. By using the following mixt. a beautiful light green was obtained: 75.5 flint, 21 $CaCO_3$ and 0.7 red slime. By using 1.4 grs. of slime a dark green was obtained. With increasing amts. browns were obtained. By adding varying amts. of this slime to light burning clays many shades of red ware may be produced.

H. G. SCHURECHT

2. Poured molds versus pressed molds. ANON. *Tonind. Ztg.*, **45,** 982–83 (1921).—Plaster molds made under pressure are much stronger and more durable than those made by casting. Pressed molds are more suitable for molding tough bodies and where considerable pressure is used in molding, while the cast molds are more suitable for casting clay wares. H. G. S.

3. The proper lubrication of ball bearings. H. BURRIE. Société des Roulements á Billes SKF. *Industrie chimique*, **8,** 276–77(1921).—The function of lubrication in ball bearings is the protection against corrosion and facilitating the longitudinal motion of the journal when such is required. The lubricant must be free from acids and alkalies (max. 0.1%), lime (max. 0.5%), resins, and all traces of impurities which might cause friction. The best lubricant is a high grade oil of suitable viscosity (depending on the nature of the work). If grease is used it must not melt at the temp. of the bearing. Graphite should never be used for lubricating ball bearings. Simple tests for detecting acidity, alkalinity, and resins, and for detg. m. p. are given. A. P.-C.(*C. A.*)

4. Dental ceramics: a treatise on the technic of porcelain manipulation. FRED R. FELCHER. *Dental Cosmos*, **63,** 387–94, 483–88, 624–32, 681–87(1921).—A comprehensive survey of the entire field. JOSEPH S. HEPBURN (*C. A.*)

5. Internal friction of liquids under high pressure. O. FAUST. (Cf. *C. A.*, **8,** 1373).—The detn. of the compressibility of lubricating oils under high pressure, and the application of the results to the tests of a high-pressure viscosimeter to obtain the values of the viscosities of the oils. J. H. HYDE. The detn. of certain physical properties of the oils used in the Lanchester worm gear experiments. ANON. Testing the viscosity of oil at high pressure. CHARLES A. PARSONS. Variation in the efficiency of a worm gear due to the differences in the lubricant employed. J. H. HYDE. An app. for the detn. of the absolute viscosities of liquids at high pressures and the results obtained with it for certain lubricating oils. J. H. HYDE. App. for the examn. of the viscosity of oils under any pressure. C. V. BOYS. Description of the oil-testing app. designed by R. M. Deeley. ANON. (Cf. *C. A.*, **14,** 1475.) Précis of report

by T. C. Thomsen on the cup-and-ball viscosimeter designed by Michell. ANON. Report on tests made in the Lanchester worm gear testing machine on three samples of aircraft oils. J. H. HYDE. Rept. on the characteristics of the flow of oil over a journal bearing. J. H. HYDE. Memorandum on J. H. Patterson's suggested method for preventing the sepn. of oil emulsions when mixed with salt water. ANON. Results of examn. of a sample of "Aliphol Omnium" compounding medium for lubricating oils. ANON. Trials of "Oildag" in aero engines by the Air Ministry. D. R. PYE. Detn. of the frictional coeff. of shaft bearings (plummer blocks) using a lubricant with and without the addition of "Oildag." EUGENE C. BINGHAM (*C. A.*)

6. The improvement of the lubricating properties of mineral oils. J. H. HYDE. *Engineering*, **111**, 708–709(1921).—Tests made on the Deeley friction testing machine (cf. preceding abstract) and the Lanchester worm gear machine (cf. *C. A.*, **14**, 1475) prove that, on adding oleic and other organic acids to a mineral oil, a very considerable reduction in the static friction is produced. So little as 0.1% of fatty acid effects a very considerable reduction; oleic acid, acid rape oil and the rape oil fatty acids all having similar effect. The Lanchester machine shows a gear efficiency of 96.0% with straight mineral oil; on adding 0.2% of oleic acid the efficiency is raised to 96.4%.

EUGENE C. BINGHAM (*C. A.*)

7. Human waste in industry. HARRY E. MOCK. *Chem. Met. Eng.*, **25**, 369–74(1921).—A symposium. (*C. A.*)

8. Industrial benefits of research. CHARLES L. REESE AND A. J. WADHAMS. *Nat. Research Council, Reprint Circ. Series*, **18**, 13 pp.(1921).

E. H. (*C. A.*)

BOOKS

9. Les Colloides: Leurs gelées et leurs solutions. P. BARY. Paris D. 47 and 49 Grands Augustins. 508 pp. 50 fr. For review see *Rev. prod. chim.*, **24**, 538 (1921). (*C. A.*)

10. Report of the lubricants and lubrication inquiry committee. *Dept. of Scientific and Industrial Research. Advisory Council. H. M. Stationery Office*, 1920, 126 pp. S. DONKIN, Chairman. The report reviews existing knowledge of lubrication and suggests several lines along which research is needed. The following appendices are part of the report. Internal friction of liquids under high pressure. O. FAUST. (Cf. *C. A.*, **8**, 1373). The detn. of the compressibility of lubricating oils under high pressures, and the application of the results to the tests in the high-pressure viscosimeter to obtain the values of the viscosities of the oils. J. H. HYDE. The detn. of certain physical properties of the oils used in the Lanchester worm gear experiments. ANON. Testing the viscosity of oil at high pressure. CHARLES A. PARSONS. Variation in the efficiency of a worm gear due to the differences in the lubricant employed. J. H. HYDE. An app. for the detn. of the absolute viscosities of liquids at high pressures and the results obtained with it for certain lubricating oils. J. H. HYDE. Description of oil-testing app. designed by R. M. Deeley. ANON. (Cf. *C. A.*, **14**, 1475.) Précis of report by T. C. Thomsen

on the cup-and-ball viscosimeter designed by Michell. ANON. Report on tests made in the Lanchester worm gear testing machine on three samples of aircraft oils. J. H. HYDE. Rept. on the characteristics of the flow of oil over a journal bearing. J. H. HYDE. Memorandum on J. H. Patterson's suggested method for preventing the sepn. of oil emulsions when mixed with salt water. ANON. Results of examn. of a sample of "Aliphol Omnium" compounding medium for lubricating oils. ANON. Trials of "Oildag" in aero engines by the Air Ministry. D. R. PYE. Detn. of the frictional coeff. of shaft bearings (plummer blocks) using a lubricant with and without the addition of "Oildag."

EUGENE C. BINGHAM (*C. A.*)

Apparatus and Instruments

11. Modern filtering apparatus. HERMANN RABE. Charlottenburg. *Chem. Ztg.*, **45**, 501–504, 532–34(1921).—Brief descriptions, with 14 cuts, of the Kelly and Sweetland filter-presses, of the de Häen, Plausen and Passburg ultra-filters, of vacuum filters, hydraulic presses, Heine centrifugals, sand filters, filters with air pressure, and the special H_2O-purification Berkefeld and Hansa filters. J. H. MOORE (*C. A.*)

12. Study of the fundamental laws of filtration using plant-scale equipment. FRED P. BAKER. *J. Ind. Eng. Chem.*, **13**, 610–12(1921).—Theory, derivation and practical application of W. K. Lewis' fundamental filter equation are discussed. Tests were made on com. filter presses to study the filter equation and to det. consts. for defecated sugar solns. The use of the equation in designing filters is shown. For sludges containing compressible solids a constant rate of flow through filter is markedly superior to operation under const. pressure. A. R. ALBOUZE (*C. A.*)

13. Viscosimeters. F. WILBUR SHULENBERGER. *Paint, Oil, Chem. Rev.*, **72**, No. 3, 10–11, 13–14(1921).—There is a general discussion of the measurement of viscosity and a brief description of the following types of viscosimeters:—Scott, Engler, Redwood, Saybolt Universal, Saybolt Furol, Gardner and Holdt Bubble, Stormer, and Doolittle.

EUGENE C. BINGHAM (*C. A.*)

14. Constant-temperature baths. "OMEGA." *Chem. Trade J.*, **69**, 30 (1921).—A list is given of 15 mixts. for const.-temp. baths and requiring little attention for boiling temps. from 40° to 300°. For the lowest temp. a mixt. of 98% EtBr and 2% EtOH is used and for the highest temp. 90% cottonseed oil and 10% beeswax. W. H. BOYNTON (*C. A.*)

15. The pyrometer from the standpoint of the user. ARTHUR N. ARMITAGE. *Trans. Am. Soc. Steel Treat.*, **1**, 651–53(1921).—Practical suggestions of construction, standardization and operation. An elec. weld gives better results than an acetylene weld for couples. Dry fire clay in the protecting tubes increases the life of iron-constantan couples. W. A. MUDGE (*C. A.*)

16. A new centrifugal filter press. C. R. PLATZMANN. *Tonind. Ztg.*, **45**, 1081–82(1921).—A new centrifugal filter press made by Stancourt Sons and Muir Ltd., Lon. is described. The substance to be filtered is thrown with

great force against a filtering medium with a pressure as high as 1 kg./cm.^{2}. When filled the machine is stopped and the clay is easily removed by raising the outer shell of the press. H. G. SCHURECHT

17. Sandwasher. L. SCHMIDT. *Tonind. Ztg.*, **45,** 1047–48(1921).—The Bavaria Machine Co., Schwaben, make a sand washer in the form of a hexagonal rotary screen. The sand is fed in at one end while water forced in at the other washes the impurities thru the screen. Sands containing as high as 60% clay may be thus washed. The washer occupies little space and can therefore be operated indoors. H. G. SCHURECHT

18. Carbon dioxide indicator of simple design and rugged construction. ANON. *Elec. Rev.* (Chicago), **79,** 218(1921).—The instrument worked by a minute jet of steam continuously aspirates gases from the flue to which it is connected. The gas drawn through an Al filter passes into a chamber of the indicator with a porous pot inside contg. a dry reagent. A pipe connects the chamber with a vessel contg. water into which dips one end of a second pipe, the other end of which is taken into the porous pot. Some gas penetrates into the interior of this pot and is absorbed by the reagent, causing partial vacuum and the colored liquor rises in the glass tube calibrated in percentages of CO_2, which may be read at considerable distance. Renewal cartridges inserted once in 24 hrs. maintain the instrument in continuous operating condition. L. C. KRUEGER (*C. A.*)

19. Methods for measuring large volumes of gas, especially applicable to gas plants or coke ovens. C. BERTHELOT. *Rev. metal.*, **17,** 668–76(1920).—B. describes briefly, giving advantages and disadvantages, the methods for measurement by means of a gasometer, by the Pitot tube, by the Lecocq method which is based upon the detn. of the exact vol. of air admitted to the furnace for combustion of the gas, of the vol. of gas drawn out by the exhauster, of the NH_3 in the gas and in the wash water, and at some length, the Murgue method which is based upon the measurement of the loss in pressure caused by a diaphragm inserted in the gas main, the difference in pressure on the opposite sides of the diaphragm being measured by a manometer. The app. is very exact, measuring variations within 0.01 mm. J. L. WILEY (*C. A.*)

20. Mill for colloidal comminution in industrial chemical work. C. NASKE. *Z. Ver. deut. Ing.*, **65,** 495–96(1921); cf. *C. A.* **15,** 1584.—The characteristics and importance of org. colloids as regards plant nutrition, and of inorg. colloids as regards *ceramics*, colors, photography, etc., are discussed. Methods of prepg. dispersions may be either by elec. or mechanical means. A hammer mill has the disadvantages that an increase in speed increases the air resistance; much heat is evolved to no purpose; and the finest particles, which should be further subdivided, escape the beaters and are carried through the gratings with the air stream. A ball mill has the disadvantages that the velocity of fall of the balls is small, the work done per blow small and the number of blows few. Hence, an impractical length of time is required for colloidal comminution, Plauson's "Colloidmill" first made possible the mechanical prepn. of dispersoids on a large scale by modifying a hammer mill so that the beater arms impinged

on a liquid surface. P. further operated the rotor at very high peripheral speed to increase the number of blows per unit of time. Two cross-sections of the mill are shown. It consists of a water-cooled cylindrical casing with axis horizontal, and on eccentrically mounted rotor whose projections work past similar projections fixed on the casing and on an adjustable bottom bed plate. When the rotor is operated at high speed the liquid is flung off the rotor and again sucked in bringing fresh particles into contact. The centrifugal force also sets up a rotation of the liquid in the casing. The suspension to be ground enters at the top and is discharged at the bottom of one side. A very powerful hammering action is obtained. Heat and elec. effects assist in the comminution, the latter tending to keep the fine particles sepd. Difficulties as regards shaft packing and strength of parts have been partially overcome, the latter by using "spring steel plate." A fineness of 0.3μ is obtained at 20, of 0.1 μ at 30 and colloidal size at 40 m. per sec.

C. C. HERITAGE (*C. A.*)

Chemistry, Physics and Geology

21. The equilibrium diagram of the iron-silicon system. TAKEJIRÔ MURAKAMI. *Science Reports Tôhoku Imp. Univ.*, **10**, 79–92(1921).—By means of magnetic and thermal analyses, as well as microscopic observation, the Fe-Si alloys contg. less than 32.7% of Si are thoroughly investigated, and the equil. diagram obtained by Guertler and Tammann is revized. In this system, 2 compds., Fe_3Si_2 and FeSi, are found. The former is magnetic, with its critical point at 90°, while the latter is non-magnetic. F. P. PHELPS (*C. A.*)

22. A new heating microscope for high temperatures : with synchronous revolving nicols. K. ENDELL. Berlin. *Z. Krist.*, **56**, 191–93(1921).—Description of a relatively simple app., made by Leitz. It is useful in detg. m. ps., in observing sintering in Portland cement mixts., ore-flux mixts., etc., and in the study of changes in glasses and enamels. E. T. WHERRY (*C. A.*)

23. Water content of heulandite. K. H. SCHEUMANN. *Ber. Ver. Sachs.* **73**, 3–113(1921).—The results of this elaborate study are shown in the figures of 18 analyses, 15 charts of curves, and hundreds of detns. of H_2O in the mineral under different conditions, the figures of which are assembled in more than 15 tables. (*C. A.*)

24. The colloidal system of silica-alumina. J. SPLICHAL. *Chem. Listy*, **15**, 53-56, 88–90, 110–13, 140–43, 164–67(1921).—The following observations were noted during the expts.: The hydrosols, silica and alumina, ppt. each other. Even if the colloidal particles at certain conditions of concn. fail to ppt. and settle out, then the viscosity and the opalescence of the mixt. of hydrosols are to be considered as evidence of the beginning of coagulation in the system. The opalescence is caused by the dispersion phase, which septs. first in a solid form. In these cases the solid phase always remains dispersed, does not settle out and its quantity is not increased with time. In the same manner Freundlich (cf. Ishizaka, *C. A.*, **7**, 2878) and Paine (*Kolloid. chem. Beihefte*, **4**, 24(1912–13)) found that in order to obtain a measurable

coagulation in simple hydrosols, the added electrolyte must be present in a certain definite concn. The pptn. is due only to the reciprocal action of the hydrosol particles. The electrolyte, present in the hydrosols in very small concns. has no effect on the pptn.; the viscosity is decreased. The pptn. is most rapid and the viscosity is greatest in a hydrosol mixt. in which the concn. ratio of Al_2O_3 to SiO_2 is 1:3. The prepn. of the alumina hydrosol from com. Al acetate according to the procedure of Crum (*Ann.*, **89**, 156(1854); *J. prakt. Chem.*, **61**, 90(1854)) did not prove successful owing to the presence of small amts. of H_2SO_4 in the Al acetate. H_2SO_4, even in very small amts., coagulated the alumina hydrosol. To avoid this, S. prepd. the Al acetate by the action of pure $C_2H_4O_2$ on pure Al. The excess of $C_2H_4O_2$ was removed by steam distn. JOHN M. KRNO (*C. A.*)

25. Boron and silicon chemistry. Experimental investigation of very volatile material. ALFRED STOCK. *Ber.*, **54A**, 142–58(1921).—This is a resumé of S.'s very numerous contributions to the knowledge of the properties of B and Si. A subject index to the articles in which the various parts of S.'s vacuum app. are described is included. To those interested in this field this resumé will be of great value as a means of ready reference to S.'s already voluminous publications. A. R. MIDDLETON (*C. A.*)

26. Industrial electrosmosis. F. ROWLINSON. *Beama*, **8**, 341–45(1921).—Clay treated by the electrosmose process is remarkably fine and plastic. C. G. F. (*C. A.*)

27. Plasticity of clays. J. W. MELLOR. *Trans. Faraday Soc.*, **1921**, May 31 (adv. proof).—M. discusses the theory of the plasticity of clay from the standpoint of physical and mechanical properties, and also the relative value of the factors involved in proposed formulas for plasticity detn. An app. is described for measuring plasticity by means of forming spheres of standard size and applying pressure until outside cracks appear. In consideration of plasticity, he discusses grain size of clay, effect of acids, alkalies and salts on sedimentation, and the action of colloidal matter. Directions are given for isolating colloidal clay by suspension and evapn. RUSSELL M. JONES (*C. A.*)

28. Thermal expansion of some substances. I. KARL SCHEEL. Phys. Tech. Reich. *Z. Physik*, **5**, 167–72(1921).—The measurements are made by a direct method for large specimens and by a Fizeau dilatometer for small ones. Values are given from −190° to +500° for Al, Mg, Ag, *quartz, porcelain and some Jena glasses*, and from −190° to +100° for invar and some other special alloys. **II.** J. DISCH. Phys. Tech. Reich. *Ibid.*, 173–75.—D. measures with a Fizeau dilatometer the values for Cr, Mn, Mo, Ni, Ta, W, and "Elektron." F. C. HOYT (*C. A.*)

29. Progress of colloidal chemistry in ceramics since the end of the world war. H. ARNOLD. *Kolloid-Z.*, **29**, 105–106(1921). E. J. C. (*C. A.*)

30. Calcium silicide—a new deoxidizing agent. W. S. ANDERSON. *Raw Material*, **4**, 51–52(1921).—$CaSi_2$ performs 2 principal functions when added to a molten bath of iron or steel: (1) as a deoxidizing agent, (2) as a reheater.

In performing function (1) it combines with O forming $CaSiO_3$, which rises to the top of the bath in a manner similar to all slags and leaves no harmful inclusions in the metal. The reaction is extremely vigorous, hence, its reheating power. H. C. PARISH (*C. A.*)

31. The equilibria of permutites. F. W. HISSCHEMÖLLER. Univ. Technique, Delft. *Rec. trav. chim.*, **40**, 394–432(1921). (*C. A.*)

32. Ultramarine pigments. AUGUST CHAUDET. *Anales soc. quim. Argentina*, **8**, 100–4(1920).—C. cites the following expts. to support the belief that the ultramarines are solid solns. of S. If kaolin be treated with a hot concd. soln. of Na polysulfide a blue color is produced. By using either natural or artificial NaAl silicate instead of kaolin a much more intense blue is produced. If to a boiling concd. soln. of Na polysulfide an excess of dry hydrated silica be added an intense blue or violet color is produced. Slaked lime and cold concd. Na polysulfide give a blue or green color, $Mg(OH)_2$ gives the same result and so does dry starch. L. E. GILSON (*C. A.*)

33. Melting and boiling point of minerals. II. L. H. BORGSTRÖM. *Öfvers Finska Vetensk. Soc. Förh.*, **59**, A, No. 16, 14 pp.(1917); continuation of *C. A.*, **9**, 2364.—For practical purposes the ratios between the b. ps. of liquids, on the abs. scale, are the same at all pressures. Using Cl_2 as a standard of reference, this relation is shown to hold for a number of org. and inorg. substances. Extending the method to substances of geological interest, the approx. b. p. is calcd. for 14 minerals at 93 atm. pressure. E. T. W. (*C. A.*)

34. White clays and bauxites of central Georgia. ANON. *Chem. Met. Eng.*, **25**, 672(1921).—The Cer. Exp. Sta. of the U. S. Bur. of Mines located at Columbus, Ohio, has entered into a coöperative agreement with the Central of Georgia R. R. through its industrial agent, J. M. Mallory, and its president, William A. Winburn, whereby the Cer. Sta. is to investigate the white clays and bauxites along the right of way of the R. R., the lines of which pass through about 80 % of the white clay and bauxite belt of Ga. H. F. S.

35. The clays of the Tandil Mts., Argentine Republic. M. A. ZAMBONI. *Anales soc. quim. Argentina*, **8**, 190–99(1920).—Complete phys. and chem. analyses of several clays are given. L. E. GILSON (*C. A.*)

36. Graphite ore-deposits in Norbergs Bergslag. GUSTAF T. LINDROTH. *Geol För. Förh.*, **40**, 27–76(1918).—The history and production of the graphite deposits are reviewed, and their geology and petrography described in detail. E. T. W. (*C. A.*)

37. Some American dolomites. BURLEIGH B. REED AND NICHOLAS KNIGHT. *Proc. Iowa Acad. Sci.*, **26**, 377–78(1919).—Typical specimens of rock used for building stones in their respective localities were obtained in order to make a comparison of their chem. compns. Following are results of analyses: (1) From Mt. Vernon, Iowa; Niagara formation; yellowish gray, due to Fe. SiO_2 1.29, $Fe_2O_3+Al_2O_3$ 0.57, $CaCO_3$ 55.17, $MgCO_3$ 43.04, sum 100.07%. (2) West Chester county, New York; a typical dolomite not materially different from the Iowa rock. SiO_2 2.71, $Fe_2O_3+Al_2O_3$ 1.05, $CaCO_3$ 53.43, $MgCO_3$ 42.93, sum100. 12%. (3) Lockport, New York; Niag-

ara limestone. SiO_2 2.76, $Fe_2O_3 + Al_2O_3$ 1.42, $CaCO_3$ 51.85, $MgCO_3$ 43.94, sum 99.97%. This contains a sufficiently high per cent of $MgCO_3$ to class the rock as a fairly typical dolomite. (4) Milk-white crystals encrusting the foregoing specimen: SiO_2 0.18, $Fe_2O_3+Al_2O_3$ 1.21, $CaCO_3$ 81.62, $MgCO_3$ 17.15, sum 100.16%. This deviates widely from a true dolomite, as the Ca has quite largely replaced the Mg. (5) Betram, Iowa, between Mt. Vernon and Cedar Rapids. The rock is gray in color, with numerous light-colored crystals disseminated through it. Former analytical data seemed to indicate that the Mg content of the rock was in excess of the Ca, but the new work shows this to have been erroneous: SiO_2 0.90, $Fe_2O_3+Al_2O_3$ 0.90, $CaCO_3$ 55.61, $MgCO_3$ 42.58, sum 99.99%. The figures indicate a rather typical dolomite, as one would naturally expect from similar formations in the neighborhood. W. G. GAESSLER (*C. A.*)

38. The relation of structure to free alkali in sodium silicate solutions. WM. STERICKER. Mellen Inst. *Chem. Met. Eng.* **25,** 61–62(1921).—Ultramicroscopic exam. of sodium silicate solns. shows that they are 2-phase systems in which the disperse phase has a negative charge. This probably explains the discrepancies between detns. of the degree of hydrolysis by various methods. WM. STERICKER (*C. A.*)

39. Fluorspar and cryolite in 1920. HUBERT W. DAVIS. U. S. Geol. Survey, *Mineral Resources of U. S., 1920,* Part II, 65–80(preprint No. 9, published Sept. 1921). E. H. (*C. A.*)

Gypsum in 1920. RALPH W. STONE. U. S. Geol. Survey, *Mineral Resources of U. S., 1920,* Part II, 55–64(preprint No. 8, published Aug. 31, 1921). E. H. (*C. A.*)

PATENT

40. Decomposition of silicates. RITARÔ HIROTA. Japan 37,165, Sept. 25, 1920. Silicates, such as clay, feldspar, etc., are easily decomposed by heating with Na_2CO_3 or similar compd. and then treating with dil. H_2SO_4 or similar compd. *E. g.*, a mixt. of clay 100 parts and Na_2CO_3 70 is heated to dull redness for 1 hr., the product is heated with excess of 20% H_2SO_4 at about 100° during 1.5 hrs. K_2SO_4 and $Al_2(SO_4)_3$ thus produced are extd. with H_2O and pure SiO_2 remains in the residue, 95% of the clay is utilized. (*C. A.*)

Refractories and Furnaces

41. Report of the Refractory Materials Research Committee to the Institution of Gas Engineers. L. BRADSHAW AND W. EMERY. *Gas J.*, **155,** 157–60 (1921).—*Jointing materials for refractories. I. Softening point of mixtures of silica brick and clay firebrick.* Various mixts. of finely ground SiO_2 brick with fireclay brick were made into cones and the refractoriness was detd. The addition of a small amt. of fireclay to SiO_2 brick produces a greater effect than a corresponding amt. of SiO_2 brick added to fireclay brick. Thus the addition of 25% fireclay to SiO_2 brick reduces the refractoriness by $4^1/_2$ cones, and of about 43% by 6 cones, while the addition of these amts. of SiO_2 brick to

fireclay brick produces differences of 2 and 3 cones, resp. The eutectic mixt., which softens at Seger cone 19–20, has the compn. 15.01% Al_2O_3, 80.32% SiO_2, corresponding to 1 Al_2O_3 : 9 SiO_2. By submitting some of the same mixts. to a refractory test under load, it was found that the differences between the softening temps. with and without load are less in the case of siliceous mixts. than for those rich in fireclay (*C. A.*, **10,** 1782; **12,** 2118). When coarser-grained mixts. are used, the effect upon the softening point is less marked. *II. Mixtures of fireclay with fireclay grog.* The effects of mixing carefully graded amts. of grog and fireclay in the prepn. of mortars are discussed. Grog diminishes the shrinkage of the clay but also reduces the binding power and mechanical strength and makes the mixt. more difficult to spread. Coarse, medium and fine grades of clay and grog were formed into briquets for the measurement of contraction and resistance to crushing. The results are tabulated. The sharp increase in the contraction of the clay with diminishing grain size is clearly shown, as also the corresponding increase in mechanical strength, and the resistance to slag penetration. The addition of 50% of grog of the same grade largely reduces the contraction, and allows a greater penetration of slag. Differences of the same kind, but of less magnitude, are obtained by the use of only 33% of grog. Also a briquet of fine clay with coarse grog has a much greater contraction and crushing strength, and suffers less slag penetration in the mass than a mixt. of coarse clay with fine grog. Of the mixts. examnd., those composed of mixed grades of clay and grog appear to give the best results, being mechanically strong, with a sufficiently small contraction, and settling between bricks to a hard, compact mass, which is free from cracks and is not easily attacked by molten slags. By substituting ungraded building sand for grog, much inferior results were obtained. Study is being made of the beneficial effects that the addition of a small amt. of fine SiO_2 to mixts. of clay and grog would have. *Influence of oxidizing and reducing atmospheres on refractory materials. I. Behavior of clay pyroscopes and fireclay bricks in coal gas.* *C. A.*, **15,** 2972.

J. L. Wiley (*C. A.*)

42. Behavior of refractory materials under load at high temperature. K. Endell. *Stahl u. Eisen*, **41,** 6–9(1921).—See *Jour. Am. Ceram. Soc.*, **4,** 417, 1921.

43. The preparation of the dolomite-tar mixture in Thomas (basic converter) steel works. Max Backheuer. *Stahl u. Eisen*, **41,** 954(1921).—The chem. and phys. properties of the dolomite have an important bearing on the life of the converter lining. Burnt dolomite with slight loss on ignition is best but the dolomite should not be sintered since this prevents the absorption of the tar. The mixt. for the converter walls should contain 35–40% powder, 30% fine and 30% coarse dolomite mixed with 8–10% of tar. The converter bottoms are made from a mixt. of 45–50% powder, 25% fine and 25% coarse dolomite with about 12% tar. R. S. Dean (*C. A.*)

44. A method for the determination of the hardness of refractory materials at high temperature. E. Rengade and E. Desvignes. *Compt. rend.*, **173,**

134–37(1921).—Ludwick's modification of the Brinell test for hardness was applied to 8 clay bricks and 1 bauxite brick maintained at temps. varying from 1050° to 1490° in a graphite resistance furnace. Analyses of the compns. show that the Al_2O_3 content has small effect, but that the presence of alkalies causes considerable diminution in the hardness values. W. M. CLARK (*C. A.*)

45. Manufacture of fireproof materials and their use. ERNEST SCHRIEBER. *Feuerungstechnik*, **15**, 69–70(1921).—*Schamotte* is made by mixing together fireclay and quartz and burning the mass to a hard stone. Quartz-free schamotte contains clay and schamotte, while quartz-schamotte contains quartz also. Quartz-schamotte stone under 3% Al_2O_3 is considered acid. *Dinas stone* has a high SiO_2 content in the form of quartz. German Dinas stone is made by binding quartz with a refractory clay, and contains 84–90% SiO_2. English Dinas stone is made by binding quartz with CaO, and contains 97–98% SiO_2. The quartz must be calcined or the stones will swell. The mixts. are pressed together into forms, carefully dried and burned at 1500°F. Dinas stone is used in masonry which must withstand a very high temp. and is highly acid. In making MgO stone, $MgCO_3$ is burned, then ground, bound with tar and formed into shape. The mixt. is then burned at a very high temp. It is used in open-hearth furnaces, etc. Refractory bricks should not be set up with common clay but with a refractory mortar. For use with basic materials, a good mortar consists of 2 parts schamotte meal and one part plastic fireclay mixed with water to the proper consistency. For acid materials a mixt. of quartz meal and clay of high SiO_2 content is used. Refractory materials should not melt lower than Seger cone 26. Anything lower cannot be considered as a refractory. The best schamotte stone melts at 36 and the SiO_2 stone at 35. H. C. P. (*C. A.*)

46. The siliceous rocks considered from the viewpoint of manufacture of silica bricks. L. BERTRAND AND A. LANQUINE. *Bull. offic. direc. recherch. sci. ind.*, Nos. 1 and 2, **1919**, 121–27; *Rev. géol.*, **1**, 408–10(1920).—A discussion of the effect of the amt., nature, and mode of distribution of impurities in SiO_2 rocks on their use for making SiO_2 brick. E. T. WHERRY (*C. A.*)

47. Carborundum refractories in heat-treating furnaces. M. L. HARTMAN. *Trans. Am. Soc. Steel Treating*, **1**, 601–603(1921).—In addition to superior resistance at high temps., the elimination of extensive repairs compensates for a higher initial cost when carborundum is used. W. A. MUDGE (*C. A.*)

48. The question of the liquefaction of carbon. SIEGMAR MÜNCH. Wolfen. *Z. Elektrochem.*, **27**, 367–68(1921).—It has been found that graphite becomes plastic before reaching its m. p. With sufficiently high amperage small graphite rods can be melted through and welded together again. A description is given of an app. for melting large quantities of C.

H. JERMAIN CREIGHTON (*C. A.*)

49. Employment of aluminothermic corundum as a refractory product. ALBERT GRANGER. *Bull. official direction recherches sci. in. inventions*, **1921**, 297–300.—Crude corundum was pulverized, washed, treated with H_2SO_4, first cold then hot, until no further action was observed. It was then further treated with HCl and thoroughly washed with water. Several formulas are

given for prepg. mixts. to be fashioned into utensils for firing. Thus, corundum to pass a 150 sieve 8 parts, kaolin des Eyzies 1, argile de Berneçay 2. The mixt. is fashioned and fired. The product was found to withstand sudden changes in temp. and to bear the temp. of melted Pt without much fusion.

L. W. RIGGS (*C. A.*)

50. Laboratory type of electric furnaces. EZER GRIFFITHS. *Beama*, **9**, 12–18(1921).—An illus. review. G. broadly classifies elec. lab. furnaces as follows: (1) Wire or ribbon wound tubular furnaces; (2) graphite spiral furnaces; (3) C tube furnaces; (4) W and Ir tube furnaces; (5) zirconia and yttria tube furnaces; (6) granular resistor furnaces; (7) induction furnaces, low and high frequency types; (8) arc furnaces; (9) cathode ray furnaces.

C. G. F. (*C. A.*)

51. Electric heating furnaces in steel works. V. GUILLERMAN AND M. GILLOT. *Revue industrie minérale; J. four élec.*, **30**, 38–40(1921).—The use of *conducting-hearth furnaces* is a step towards insuring high quality steel. Conducting hearths are of two kinds: (1) the hearth with no resistance and (2) the resistance or heating hearth. In furnaces embodying the second type of conducting hearth heat is developed in the hearth by its own elec. resistance. This heat supplements the heat developed in the metal charge by reducing the amt. of heat given up by the charge to the hearth. The requirements to be met in constructing such a hearth are: (1) to obtain in the upper layers of the hearth enough elec. resistance and good thermal conductivity; (2) in the lower layers to obtain very low resistance and low thermal cond. From 10 to 15% of the total power used in a furnace may be expended in the hearth. In the construction of this hearth Cu bus bars are placed horizontally at the bottom of the furnace and bedded in a graphite and tar mixt. Above this the hearth is built up of a mixt. of magnesite or dolomite with graphite and soft Fe filings rammed into place with tar. The amt. of graphite and filings in the mixt. decreases as the hearth is built up and becomes *nil* at some distance from the surface. The cond. of the lower portion may be increased by embedding mild steel bars placed vertically with their lower ends in contact with the layer of graphite, their upper ends at a distance below the surface of the hearth depending on the resistance desired in the hearth. Such bottoms may last for 1000 heats on account of the variation in temp. during a heat being less in a furnace with this hearth than in an ordinary furnace; also, the high temp. of the surface of the hearth allows more satisfactory burning in of magnesite or dolomite patches.

LOUIS JORDAN (*C. A.*)

52. A new electric muffle oven for temperatures up to 1350°. H. SEIBERT. Berlin. *Chem.-Ztg.*, **45**, 772(1921); 3 cuts.—A brief description, without dimensions, of an oven made by H. Seibert & Co., Berlin, in which the resistor is nearly pure C so placed that the rectangular horizontal muffle is heated from 4 sides. It may be constructed for use with any kind of current, is easily repaired, and an oxidizing or reducing atm. may be held in the app.

J. H. MOORE (*C. A.*)

53. Researches with a flame of exceptionally high temperature. E. HAUSER AND E. RIE. *Sitz. Akad. Wiss. Wien*, Abt. IIa, **129**, 539–47(1920).—

A flame and burner are described by which it was found possible to reach a temp. of at least 3000°, the highest ever attained without the use of elec. energy. A liquid inflammable hydrocarbon is dispersed from the burner into a horizontal cone by H_2 gas. This cone is surrounded by an outer mantle of O_2 issuing from the outer part of the burner. The resultant flame is about 1 meter long, is luminous from incandescent colloidal C, and gives a continuous spectrum. If a rod of C is placed in the flame a layer of crystal graphite forms where the central hottest part of the flame has been in contact. If a porcelain plate is held in the flame a layer of soot or amorphous C is first deposited, but this is transformed to graphite when heated for a longer time in the hottest portion of the flame. This *graphite* possesses an unusual appearance. It consists of thin sharp platelets with a distinctly metallic cast on the side next to the porcelain, together with some small, transparent, strongly refracting crystals. On the other side the deposition is in fairly regular hexagonal figures similar in appearance to those resulting from the pptn. of colloidal graphite. Soot from camphor and wood charcoal both produce similar graphite in this flame. SiC_3 and carborundum are easily formed, and Zr, W, Mo and Cr melted. Excellent photomicrographs are given. The graphite was identified through its conversion to yellow graphitic oxide by the method of Staudenmaier (*Ber.*, **31,** 1481(1898); **32,** 1394 and 2824(1899)).

G. L. CLARK (*C. A.*)

54. Electric furnaces: Laboratory types. EZER GRIFFITHS. *Beama*, **9,** 145–50(1921); cf. *C. A.*, **15,** 3249.—A review. In this installment C resistor furnaces, the Arsem furnace and high (gas) pressure furnaces are dealt with in detail. Well illustrated. C. G. F. (*C. A.*)

55. The importance of air supply in combustion of coal. HENRY KREISINGER. *New Jersey Ceramist*, **1,** 39(1921).—A general discussion of the processes of the combustion and their control in the operation of hand fired furnaces. C. W. PARMELEE.

PATENT

56. Kiln and method of operating the same. LOIS M. UNDERWOOD. U. S. Reissue U. S. 15,186, Aug. 30, 1921. Original U. S. 1,337,298, April 20, 1920. In a kiln provided with a stationary furnace and a gas producer chamber, and a conduit forming a passageway from the chamber to the combustion chamber of the kiln, and an auxiliary air conduit through which additional air is supplied to the combustion chamber, and a portable grate including a series of hollow tilting bars with nozzles through which steam and air are injected into the bars, a series of tuyeres mounted on each bar and having air passages communicating with the interior of the bars, and an individual steam injecting nozzle extended into the nozzle of each of the bars.

BOOK

57. The Electric Furnace. J. N. PRING. London: Longmans, Green and Co. 485 pp. 32s. (*C. A.*)

Abrasives

PATENT

58. Apparatus for making carbides. J. H. Reid. Can. 180,785, Dec. 4, 1917. Electrodes are placed in combination with means for feeding material to and between them and a support or hearth which retains material not fully converted within the zone of reaction until conversion is completed and which provides for the continuous flow of the converted product from the zone of reaction. Means are specified for varying the position of the zone of reaction with respect to the material in order that arcing may be prevented. (*C. A.*)

Whiteware and Porcelain

59. Glimpses of Ohio ceramic industries—II. Chester H. Jones. *Chem. Met. Eng.*, **25,** 619–22(1921).—A general description of methods and equipment used in the mfg. of tableware in the plant of the Crooksville China Company, at Crooksville, Ohio. H. F. S.

60. Physical and mechanical testing of porcelain insulators. O. Boudouard. *Ceramique*, **26,** 79(1921); *Keram. Rundschau*, **29,** 496(1921).—Permeability, comp. strength and resistance to temp. changes were tested on porcelain insulator bodies. The test pieces in each case were cylindrical in shape having a diam. of 50 mm. and ht. of 5 mm. for the permeability tests, and a diam. of 30 mm. and ht. of 60 mm. for the comp. tests. Those used for studying the resistance to sudden temp. changes had a diam. of 100 mm. and heights of 5 mm., 15 mm., 25 mm., 35 mm., 45 mm. and 55 mm., respectively. The test pieces for permeability tests wree turned on a potter's wheel while the others were made dry press in a metal mold. The chem. analyses of the different bodies follow:

	1	2	3						
SiO_2	72.21	67.87	70.01	1.	RO	3.20	Al_2O_3	18.13	SiO_2
Al_2O_3	22.26	26.88	25.30	2.	RO	4.17	Al_2O_3	17.85	SiO_2
CaO	0.78	0.89	0.61	3.	RO	4.23	Al_2O_3	20.08	SiO_2
MgO	0.17	tr.	tr.						
K_2O	1.42	2.29	3.67						
Na_2O	2.38	1.50	0.49						

The permeability was measured by sealing the test pieces in a glass tube and noting the amt. of water which passed through. All test pieces tested were impervious to water. In testing the resistance to sudden temp. changes the specimens were placed in running water at 13°C for 15 mins. after which they were plunged into boiling water. This was repeated 3 times for each specimen. Bodies 1 and 2 withstood these tests well except that the 5 mm. pieces were somewhat warped. The test pieces showed many cracks.

		Compressive strengths.	Load in kgs.	kgs./cm.^{2}
1	7.07 cm.^{2}	14,250	8,500	11,000	1,591
2	.....	12,000	11,600	15,600	1,838

H. G. Schurecht

61. One solution of the porcelain insulator problem. E. E. F. Creighton and F. L. Hunt. *Elec. Rev.*, **79**, 17–20(1921); *J. Am. Inst. Elec. Eng.*, **40**, 480–82(1921).—Failure in cemented porcelain insulators is prevented by arresting the expansion of the cement used, through removal of the moisture when it is thoroughly set and preventing the moisture from re-entering it and causing repeated expansions. This is done by impregnating the cement after it has set with a pitch under vacuum and heat treatment. Small pieces so treated can be soaked in H_2O for days without showing absorption. Insulators thus prepd. have been installed on a 66,000-volt transmission line near the seashore for 3 years without a single failure occurring.

L. C. Krueger (*C. A.*)

62. Tests for laboratory porcelain. Anon. *J. Proc. Inst. Chem.*, **1920**, III, 210–14; *Analyst*, **45**, 397–98(1920).—The tests described are those adopted by the sub-committee on porcelain of the Glass Research Committee of the Inst. of Chemistry. (1) *Appearance, shape and weight.*—These should at least come up to that of the porcelain in former use. The wts. of vessels should not exceed pre-war av. wts. for articles of similar size. (2) *Tests for porosity of body and imperfections in glaze (dye test).*—A 0.5% soln. of eosin in water answers well. Some vessels are filled and broken pieces of others immersed in the sol. for 18 hours, after which they are rinsed, dried and examd. with a hand lens. Good porcelain shows no staining at all. If the articles fail under this "dye" test, it is extremely unlikely that they will stand the remaining tests. (3) *Resistance to heat and sudden changes of temperature.*—(*a*) The vessels are heated by direct application of Bunsen burners, and then lifted with small cold tongs onto cold pipeclay triangles to cool. This is repeated six times and the "dye" test again applied. (*b*) After thorough drying the same vessels are heated as before and cooled by being placed on cold metal (clean sheet lead). The "dye" test as before is then applied. (4) *Constancy of weight and resistance of glaze to high temperatures.*—(*a*) Vessels should suffer no loss of wt. after heating for several hrs. at a good red heat and should show no tendency to stick to pipe clay, silica or other supports. (*b*) The condition of the glaze should be noted after heating for 4 hrs. at 950°. No blistering or coaging should result. (5) *Cleaning test.*—Cleaned, ignited and weighed vessels should show no change in wt. after immersion for 12 hrs. in dil. acid followed by rinsing, wiping and ignition. Under this test, if the body is porous, liquid will have entered and on the application of sudden heat particles of glaze or porcelain will be thrown off by vapor generated from the imprisoned liquid, with resulting loss in wt. (6) *Resistance of glaze to acid and alkali.*—The loss in wt. sustained after prolonged treatment with boiling acid, Na_2CO_3 and NaOH should not exceed that found in comparison with high grade pre-war procelain. Two simple *tests for Pb* are finally given: (1) The porcelain is touched with HF, warmed, and the acid allowed to evap., followed by H_2S water faintly acidified with acid. (2) Fragments of the porcelain are heated to bright redness for 4 hours in a current of H_2. No darkening should ensue.

J. B. Patch (*C. A.*)

63. Modern production of (porcelain) suspension insulators. E. H. FRITZ AND G. I. GILCHRIST. *J. Am. Inst. Elec. Eng.*, **40,** 470–79(1921).—A review of progress in making porcelain. The chief improvement is that the feldspar and flint, which were formerly mixed together with the clays in the blungers, are now first wet-ground in ball mills long enough to produce the necessary fineness. The higher dielec. and mechanical strength obtained more than counterbalances the cost to the extra operation. Care in filtering the slip produces filter cakes of such qualities as to eliminate the necessity of aging. CHARLES HECKER (*C. A.*)

PATENT

64. Baking porcelain insulators. MAGOEMON EZOE. Japan 37,166, Sept. 25, 1920. The procelain insulator is set in a round flat box and baked, the top of the insulator being completely covered with glaze. (*C. A.*)

BOOK

65. Chinesisches Porzellan. OTTO PELKA. Leipzig: H. Schmidt and C. Günther. M. 30. (*C. A.*)

See also No. 28.

Heavy Clay Products

66. Increase in strength of sand lime brick. W. DRAKEBUSCH. *Tonind. Ztg.*, **45,** 1170–71(1921).—The effect of aging on the strength of a no. of sand lime brick was investigated. The following limes were studied: 1. White lime with 90.12% $Ca(OH)_2$ and 0.95% SiO_2.; 2. Hydraulic lime with 73.05% $Ca(OH)_2$ and 19.65% SiO_2; 3. Hydraulic lime with 73. 88% $Ca(OH)_2$ and 15.55 % SiO_2; 4. Hydraulic lime with 88.40% $Ca(OH)_2$ and 5.52% SiO_2 and 5. Hydraulic lime with 74.28% $Ca(OH)_2$ and 12.78% SiO_2. The lime was dissolved in water and mixed with sand. The mixtures were allowed to stand 24 hrs. after which they were molded into test pieces and hardened in an autoclase by subjecting same to a pressure of 8 atms. for 9 hrs. The results are given below and show that the strength of sand lime brick increases upon aging and that hydraulic limes produce stronger brick than white limes.

6% lime	Compress. strength kg./cm.² 7 days	30 days	90 days	180 days	8% lime	Compress. strength kg./cm.² 7 days	30 days	90 days	180 days
				Stored dry					
1a	128	151	137	184	1b	152	166	181	205
2a	209	225	211	227	2b	244	280	302	330
3a	170	219	213	237	3b	153	200	236	261
4a	145	176	190	192	4b	142	173	219	216
5a	197	196	225	222	5b	211	206	238	241
				Stored wet					
1a	119	128	142	193	1b	130	158	146	012
2a	190	208	213	241	2b	239	272	291	303
3a	160	219	219	245	3b	150	170	232	309
4a	133	156	184	192	4b	119	148	191	194
5a	159	177	211	223	5b	103	165	242	242

H. G. SCHURECHT

67. A note on body cracking of terra cotta. E. C. Hill. *New Jersey Ceramist*, **1**, 70(1921).—The author concludes that fire cracking may not be due to variations in the firing temp.; that it seems possible to crack a body of almost any compn. by too rapid cooling; that a considerable range of compn. is possible in bodies without producing fire cracking, if the pieces are cooled slowly; dense bodies are more sensitive, therefore the use of grog of suitable size and quantity is advisable; the greater the amt. of sandy clays used the greater the contraction between 650° and 850°C; the most effective prevention is slow cooling at the lower temps. particularly from 650° to 500°C.

68. Some causes of the so-called disintegration of terra cotta brick, and allied ceramic material and suggested remedies. H. A. Plusch. *New Jersey Ceramist*, **1**, 65(1921).—Discussed under the following headings (1) High porosity of the body; (2) High silica content of the body; (3) The effect of sol. salts; (4) Poor workmanship; (5) Lack of mortar in joints and poor mortar; (6) Uneven thickness of ware; (7) Effect of the sun and frost; (8) Settlement of buildings. C. W. Parmelee

69. Properties and tests of tiles. Anon. *Kalk-, Gips- u. Schamotte-Ztg.*, **27** (Nov. 21, 1920); *Chimie & industrie*, **6**, 206(1921).—There are as yet no official standards for tiles; and moreover their properties vary within very wide limits according to the method of manuf., *e. g.*, the crushing strength can vary from 25–250 kg., the lower values being found with hand-made tiles. Certain dealers and municipalities have adopted regulations varying according to the nature and shape of the tiles and covering the amt. of H_2O absorbed, tightness to water, content of noxious substances, apparent sp. gr., d., fragility, resistance to the action of frost, uniformity, and color. Certain of these properties can be easily gauged, while others require special tests carried out on the roof itself. A. P.-C. (*C. A.*)

70. Manufacture of gas-clinker brick at the Wurzburg gas plant. F. Greineder. *Gas. u. Wasserfach*, **64**, 245–47(1921).—Bricks suitable for building purposes are being made from the clinker from the gas retorts and generators. The plant has sufficient assorted clinker to make 1,150,000 bricks yearly. For making 1000 bricks there is required 4.5 cu. m. of ground clinker, 0.5 cu. m. of cement, 0.8 cu. m. of water. The total cost per 1000 bricks, including depreciation and interest charges, is 437.19 marks. About 7.5% is being realized on the investment. J. L. Wiley (*C. A.*)

71. The artificial drying of bricks. F. Scholz. *Kalk-, Gips- u. Schamotte-Ztg.* **27**, Nos. 3 and 4(Feb. 27 and 21, 1920); *Chimie & industrie*, **5**, 559(1921).—Review of the various sources of heat used for the drying of bricks: exhaust steam, heat lost by radiation from the kilns, heat lost from the kilns in the cooling chambers, flue gases from the kilns and from the boilers.
A. P.-C. (*C. A.*)

72. The utilization of slag: The manufacture of slag building bricks. H. Koch. *Industriebau*, **12**, 23–27(1921); 13 illus.—Detailed account of the Elberfeld plant. Relative costs for 1 cu. m. of wall: Ordinary clay or red brick requires 114 kg. coal in the course of manuf.; slag brick with Portland

cement binder, 64 kg. coal; slag brick with blast furnace cement binder, 33 kg. coal. C. G. F. (*C. A.*)

73. The equipment and operation of Brooklyn Crozite brick plant. ANON. *Concrete*, **18,** 74–78(1921).—This plant is of special interest as a products manufacturing achievement in the elimination of manual labor. Its working capacity is 100,000 concrete brick per 8-hr. day. In recent tests concrete brick show a remarkable superiority over clay brick, as well as an unusually uniform quality. F. H. HOTCHKISS (*C. A.*)

PATENTS

74. Bricks; pottery. C. W. WALLACE. Brit. 162,483, March 11, 1920. Bricks, pottery, and artificial stone products are obtained from clayey material, *e. g.*, as the white clayey material found near Molo in British East Africa, by introducing pressed, turned, or otherwise shaped, or unshaped pieces of the clay directly into the flames of a furnace, heating throughout, and effecting sudden cooling by plunging into H_2O, etc. (*C. A.*)

75. Furnace for manufacturing tile. TÔDA MOROTA. Japan 37,173, Sept. 28, 1920. The furnace has 2 doors opposite each other. Flames are conducted to the top of the furnace, then to the inner part through shelves on which tiles are placed. (*C. A.*)

Glass

76. Graded seal for joining Pyrex to lead glass. W. C. TAYLOR AND AUSTIN BAILEY. App. Div. Corning Glass Works, Corning, N. Y. *J. Ind. Eng. Chem.*, **13,** 1158(1921).—A seal consisting of five glasses intermediate between Pyrex and lead glass has been developed. All of the intermediate glasses are of a lead-free borosilicate compn., and are comparatively stable and can be worked repeatedly without devitrification. ED.

77. Tests for laboratory resistance glassware. ANON. *J. Proc. Inst. Chem.*, **1920,** Part III, 202–10(1920); *Analyst*, **45,** 396–97(1920).—The Glass Research Committee of the Inst. of Chemistry use the following tests to ascertain whether or not lab. glassware may safely be considered as resistance glass: (1) *Preliminary treatment.*—Cleaning with boiling water followed by 5% acetic acid. (2) *Treatment in autoclave.*—This affords a rapid sorting test for resistance glass. The glass vessel, filled with distd. water, is heated for 3 hrs. in an autoclave at a registered pressure of 4 atms. Any matter dissolved is then estd. by drying a portion of the soln. for 1 hr. at 120°, followed by ignition (not above 650°) for 3 min. The result is expressed as mg. residue per sq. dm. The alkalinity of the rest of the water is detd. by titration with methyl orange as indicator. Results are expressed as cc. 0.01*N* H_2SO_4 per sq. dm. Residue must not exceed 4 mg. per sq. dm. Alkalinity should not require more than 5 cc. 0.01*N* H_2SO_4 per sq. dm. The glass must not flake nor peel. (3) *Treatment with reagents.*—HCl (sp. gr. 1.15) is boiled for $^1/_2$ hr. in the vessel to be tested, the whole being kept in an air bath at 140°. This is repeated 3 times (each time with fresh acid), and finally the dissolved residue is dried down with a little $(NH_4)_2CO_3$, ignited and weighed. SiO

and Zn are both to be tested for in the residue; after the acid treatment the same vessel is tested by boiling in it 0.5 *N* NH_4Cl and NH_4OH, the dissolved matter, if any, being detd. as before; all results are expressed as mg. per sq. dm. Finally 0.5*N* NaOH is employed, the residue being tested for Zn and Pb. Residue from HCl test must not exceed 2 mg. per sq. dm., and that from NH_4Cl and NH_4OH test 1.5 mg. per sq. dm. (4) *Heat tests.*—Alternative methods. (*a*) The flask or beaker is heated in an air oven to 120° for $^1/_2$ hr., and then instantly immersed in cold water. (*b*) The vessel is filled with soft paraffin wax and heated to about 155° and plunged in cold water; this is repeated at increasing temps. (25° intervals) until it breaks. Good quality vessels will stand this treatment up to 200°. (*c*) A soln. of $CaCl_2$ (sp. gr. 1.33) is boiled in the vessel for 5 min. and the whole then plunged into water at 0°. (*d*) Another vessel full of water at 0° is plunged into boiling water. Vessels should not crack when submitted to tests under (*a*), (*c*) and (*d*). (5) *Tests for As and Sb.*—Full accounts of testing for these elements are given, with a diagram of the app. for distn. (6) *Annealing.*—The vessels are examd. under polarized light to detect internal stresses. J. B. PATCH (*C. A.*)

78. Plate glass manufacture. *Glassworker*, **41,** No. 10, 1, Dec. 3(1921); from *Ford News* of Nov. 15, 1921.—The Ford Co. announces a new method of making plate glass for windshields. The batch is melted in a 355 ton tank and flows from this onto a moving sectional cast iron table which travels under a stationary roller adjusted to the desired thickness. Sheets are 24″ wide by $^3/_8$″ thick. The conveyor plates are cooled with soapy water. From the table the conveyor carries the glass through a 464 ft. leer in 2 $^2/_3$ hours. The continuous sheet is then cut and set on grinding tables each unit 90″ long and passes under 180 ft. of grinding machinery and then under the polishing machinery after being washed. The travel of the glass is continuous from start to finish. R. J. MONTGOMERY.

79. Carrying large plate glass sheets. J. W. CRUIKSHANK. *Glassworker*, **41,** No. 4, 11, Oct. 22(1921).—Large sheets 12 ft. by 20 ft. weighing 1400 lbs. required 16 men to carry by hand. In 1907 a clamp like an ice tongs was installed and this type with improvements is in use today. The present clamp will release and clamp glass automatically due to a simple spring arrangement. One clamp at the center of the top edge is enough and does not cause undue strain. Suction discs have been used to lift glass from the grinding tables to advantage. R. J. MONTGOMERY

80. The electrical properties of glass. J. R. CLARKE. *Beama*, **8,** 235–38 (1921).—A review including a bibliographical list of 38 references. C. makes a number of definite recommendations on the basis of his own experience and that of others. For glass line insulators, in addition to the elec. and mechanical properties, one has also to consider cost. This necessitates the manuf. from cheap materials, in a tank furnace, thus excluding the use of Pb. The surface leakage must be low and hence the resistance to chemical attack fairly high; the specific inductive capacity should be low, to reduce flashover and the dielec. strength fairly high to prevent penetration. The coeff. of ex-

pansion must be low and the glass should be well annealed. All these conditions indicate a glass of high SiO_2 content. A potash-lime glass with as high a SiO_2 content as possible would be best on the basis of present data. Further research is needed. For glass condensers, a Ba-borosilicate glass has so far proved to be most serviceable. C. G. F. (*C. A.*)

81. Glass blowing in scientific and industrial laboratories. H. Vigreux. *Chimie & Industrie*, **6**, 160–68(1921).—Brief historical sketch of the development of glass blowing together with hints on glass blowing, the difficulties encountered by the beginner, and the method of overcoming them.

A. P.-C. (*C. A.*)

82. Standardization of chemical apparatus. Freymuth. Berlin. *Z. angew. Chem.*, **34**, Aufsatzteil, 357–59(1921); 3 cuts.—A standardization of glass app., made of a glass of minimum alkali content, would eliminate useless expenditure and save quantities of cork and rubber materials.

Theo. F. Buehrer (*C. A.*)

PATENTS

83. Glass manufacture. T. C. Moorshead. 10/9/19; Ill. Off. Jour. Pats. 9/7/21. Pp. 3946–48. Covers a multiple automatic glass press. Special feature is the gathering and placing of the gathering in the mold in an unchilled state. Five drawings. Wm. M. Clark

84. Glass Furnaces. W. G. Clark. Brit. Pat. 163,995; Ill. Off. Jour. Pats. 7/20/21. Pp. 3024. An elec. heated delivery trough is used to facilitate starting up in the cold. Heating may be performed by either resistance units or passing alternating current through the glass. Illus. by sketch. Wm. M. Clark

85. Bait for glass-drawing machine and in the process of drawing glass. Arthur E. Spinasse. U. S. Reissue. U. S. 151,143, July 5, 1921. Original U. S. 1,170,464, Feb. 1, 1916. A bait for drawing hollow glass or cylinders from molten glass comprising means for supplying distending air pressure thereto, and means for forming and lifting without adhesion a glass novel, the means being adapted to support the novel without producing rupturing strain thereon during the drawing operation.

86. Method and apparatus for making glass articles. Clyde R. Lott. U. S. 1,382,994, June 28, 1921. The combination of a blank mold and a finishing mold located side by side and each comprising sections hinged to swing horizontally to open the mold, the molds arranged so that each mold is opened at the side facing the other mold and automatic means to transfer a blank by a horizontal movement from the blank of the mold into the finishing mold. C. M. Saeger, Jr.

See also No. 28.

Cement, Lime and Plaster

87. Special high resistance Portland cements. K. Endell. *Zement*, 9, 25–28(1920); *Chimie & Industrie*, **5**, 317(1921).—E. gives the results obtained in the course of tests of special German and Austrian cements which had a

remarkably high strength at the end of 2 days, tensile 10 kg. and compressive 180 kg. [per sq. mm.—ABSTR.]. Such results are of no great practical importance. Müller Rüdersdorf, in the course of the testing of several hundred samples of com. cements, found the following values at the end of 28 days: 8% below 300 kg., 14% 300–50 kg., 26% 350–400 kg., 15% 400–50 kg., 22% 450–500 kg., and 15% 550–600 kg. The strength requirements at present in force are sufficient for all purposes. The production of special cements is easily obtained by adding more CaO, but this entails 2 drawbacks: getting too near the limit where expansion is liable to occur, and greater fuel consumption for burning. These are scarcely compensated by the possibility of removing the forms from the reinforced concrete work at the end of 2 days.

A. P.-C. (*C. A.*)

88. The behavior of cement mortars in sulfate-bearing waters. H. NITZCHE. *Zement*, **9**, 37–40, 50–53(1920); *Chimie & industrie*, **5**, 317(1921).—As a result of serious troubles encountered with concrete work carried out in the neighborhood of Frankfort, where there is a subterranean sheet of sulfate-bearing water, N. carried out numerous tests in which local contractors were interested. Two large tables give a summary of the results obtained on concretes having varying amts. of Portland cement and of slag cement immersed in pure and in sulfate-bearing waters during 1, 2, and 3 yrs. Numerous photographs are given of the test pieces thus treated. Cf. *C. A.*, **14**, 606.

A. P.-C. (*C. A.*)

89. Experiments with blast-furnace slag. H. BURCHARTZ. *Stahl u. Eisen*, **41**, 193–200(1921).—The following conclusions regarding the use of blast-furnace slag in *cement* are drawn. The resistance of reinforced concrete to sea water is dependent on the density of the cement. *Cement* from blast-furnace slag made in the following proportions, 1 pt. cement, 2 pts. fine slag, 3 pts. coarse gravel, is as good as silica cement. Cf. *C. A.*, **14**, 3143.

R. S. DEAN (*C. A.*)

90. The addition of trass to cement. C. PLATZMANN. *Zement*, **9**, 227–28 (1920); *Chimie & industrie*, **5**, 317(1921).—Tests carried out on mixts. of 1 part by wt. of cement, 0.5–1 part of trass, and 4, 6, 8, and 11 parts of gravel led to the following conclusions: trass may be added to the mixt. to economize cement, its physical and chem. properties being suitable for the purpose. Cement-trass-gravel concretes were stronger than cement-gravel concretes having the same cement content, owing to the fineness of the trass. From an economic point of view, concretes to which trass has been added are not more expensive than those which do not contain any. A. P. -C. (*C. A.*)

91. The relation of carbon dioxide and moisture to the setting time of cement S. L. MEYERS. *Concrete, Mill Section*, **18**, 128–30(1921).—M. states: CO_2 is readily absorbed by tricalcium aluminate. This absorption of CO_2 by the aluminate in Portland cement causes an acceleration of setting time. This acceleration of setting time is due to the positively charged aluminate in dispersion adsorbing the negatively charged carbon ion, resulting in coagulation after the cement is gaged with water. The effect of hydration alone is

to retard the set, but in combination with CO_2 hydration indirectly acts as an accelerant by aiding carbonation. J. C. WITT (*C. A.*)

92. Automatic machine tests setting time. C. R. HILL. *Concrete*, **18,** 126(1921).—A machine is described for automatically detg. the setting time of cements and plasters by means of Gillmore needles. The cement test pat is carried on a plate which moves in a horizontal plane at a speed which may be regulated to accommodate different classes of materials. The needles are lowered to the cement at frequent intervals by the action of a cam.

J. C. WITT (*C. A.*)

93. Artificial paving blocks. J. KLINKMÜLLER. *Verh. Ver. Beförd. Gewerbfleiss.*, **3,** 69–96(1920); *Chimie & industrie*, **5,** 64(1921).—Review of the various materials proposed in Germany for the prepn. of paving blocks and of a series of patents relative to the use of cement or asphalt concretes, with or without reinforcing. A. P.-C. (*C. A.*)

94. Judging the quality of Portland cement. R. J. COLONY. *Trans. Am. Inst. Mining and Met. Eng.*, No. **1039** (Feb., 1921).—Chem., mech. and petrographic methods are suggested for detg. the quality of cement to supplement the standard tests. A long series of studies has shown that the 3 constituents that form the bulk of Port. cement (CaO, SiO_2, and Al_2O_3) exist as fixed components with definite chem. compn. and const. optical properties. With these 3 compds. forming apices of a triangle, a diagram is made and the percentages of the samples are plotted. About 50 analyses were plotted on the diagram and all but two fell within a restricted triangular area. The changes of the tricalcium silicate, tricalcium aluminate, tricalcium ferrite, beta calcium ortho silicate and gypsum when H_2O is added to cement are described briefly. Limiting ratios of cement based on a minimum silicate content are used as a check and cements having a lower ratio are regarded with suspicion. The results of tests and anaylses of 6 samples are shown. The use of the limiting ratios is a simple easy method of judging the quality of Port. cement when used in connection with the usual standard tests. Results obtained are so suggestive that further work is now in progress.

C. N. W. (*C. A.*)

95. Relation between tensile and compressive strengths of cement mortars. J. R. DWYER. *Concrete, Mill Section*, **18,** 99–101(1921).—On the basis of a considerable no. of tests D. concludes: The *T-C* ratio varies greatly with differences in compressive strengths of Portland cement mortars, and also varies somewhat for difference in materials and proportions. The variation is greatest at comparatively low compressive strengths, and below about 1,500 lbs. for 2-in. cubes may be extremely misleading. It is evident from data presented herewith that the tensile test favors cements which are weak in compression, and gives little indication of their comparative compressive strengths. J. C. WITT (*C. A.*)

96. The analysis of fibro-cement. B. J. SMART AND P. C. PECOVER. *J. Soc. Chem. Ind.*, **40,** 185–6T(1921).—S. and P. det. the approx. % of cement in cement-asbestos mixts. by treating with 20% HCl and detg. the Ca in the

ext. The asbestos adsorbs some SiO_2; hence high results are obtained for the asbestos by direct weighing of the residue. The adsorbed SiO_2 can be extd. with "alkali." E. G. R. ARDAGH (*C. A.*)

97. The cement factory in Torda (Siebenburgen, Hungary). H. SZEKELY AND E. HAVAS. *Beton u. Eisen*, **20**, 41–3, 66–9, 87–90(1921).—Dimensioned drawings give many details. The thick slime process of Smidth & Co. is to be used. Limestone and argillaceous schist are the raw materials. Natural gas is the fuel. JAS. O. HANDY (*C. A.*)

98. Researches on the volume alteration of cement and cement mortars on setting; influence of water addition, the method of mixing and of the cement on the extent of the volume changes; the relation between the length of iron reinforcement and the setting of cement mortar; the rate of expansion and contraction of natural stone when wet and dried. OTTO GRAF. *Beton u. Eisen*, **20**, 72–4 (1921).—A continuation of an undated earlier article. Cf. *C. A.*, **8**, 811. JAS. O. HANDY (*C. A.*)

99. A critical review of the wet process for manufacture of Portland cement. RICHARD K. MEADE. *Concrete, Mill Section*, **18**, 77–85(1921).—A detailed analysis is given, based on considerable data, whether the wet or dry process is best for the manuf. of Portland cement from hard, dry, raw materials. F. H. HOTCHKISS (*C. A.*)

100. The effect of temperature on some of the properties of materials. F. C. LEA. *Engineering*, **110**, 293–98(1920).—The results of expts. conducted in a non-inductively wound elec. furnace are given. They are of special importance to the builder and engineer. The tests include the detn. of the Brinell number, breaking strength, elastic limit, yield point, modulus of elasticity, elongation and reduction of area at fracture of heat cement and reinforced concrete. The effects of varying the temp. gradient and of reheating are also shown. The results are given in curves and some photomicrographs of the treated materials are shown. P. D. V. MANNING (*C. A.*)

101. Determination of available lime in quicklime and hydrated lime. ALICE I. WHITSON. *Chem. Met. Eng.*, **25**, 740(1921).—Details of a modified Scaife method. H. F. S.

102. The slaking of lime. KOSMANN. *Verh. Ver. Beförd. Gewerbfleiss.* No. **5**, 61–65 (May, 1920); *Chimie & industrie*, **5**, 317(1921).—The paste resulting from the interaction of CaO and H_2O during slaking and from the transformation of the $Ca(OH)_2$ to the colloidal state is due to the formation of a gel of Ca tetrahydrate (64%) and of a sol. of lime water (36%) contg. 4.572% of CaO. A. P.-C. (*C. A.*)

103. Rotary kiln lime-burning plant. ANON. *Blast Furnace and Steel Plant*, **9**, 467–68(1921).—An illustrated description of the new plant of the Granite City Steel Works. E. H. (*C. A.*)

104. Fine art of lime burning. GEO. B. WOOD. *Chem. Met. Eng.*, **25**, 705(1921).—General description of methods and equipment used in burning lime in the new plant of the Rockland & Rockport Lime Corporation, Rockland, Me. H. F. S.

105. The cementing qualities of the calcium aluminates. P. H. Bates. *Bur. Stand. Tech. Paper*, **197.**—The four calcium aluminates, $3CaO.Al_2O_3$,$5CaO$, $3Al_2O_3$, $CaO.Al_2O_3$, and $3CaO.5Al_2O_3$, which are the only anhydrous compds. of lime and alumina, were prepared in a pure condition by heating together the proper propn. of the oxides. After microscopic examn. had shown that homogeneous compounds had been formed, the products were finely ground and their cementing qualities when gauged with water were determined. The two compds. higher in lime reacted very energetically with the evolution of much heat, acquiring practically instantaneous set. The two higher in alumina reacted with water more like Portland cement, but showed higher strength at early periods than the latter. These were then prepared in larger quantities and containing such impurities as silica, iron oxide, and magnesia. The two compds. $CaO.Al_2O_3$ and $3CaO.5Al_2O_3$ were burned in a 2 by 20 ft. rotary kiln, varying their compn. so that the silica, iron oxide, and magnesia reached limits of 17.38, 3.10, and 3.66 per cent, respectively, as maxima in a series of eight cements. The process of manuf. was entirely similar to that used in the prod. of Portland cement. The ground cements were used in making the usual small tension and compressive test pieces and 6 by 12 in. gravel concrete cylinders of 1 : 1.5 : 4.5 and 1 : 3 : 9 propns. The striking feature of the data obtained from testing these at different periods up to and including 3 yrs. was the very high 24-hr. strength. The rich concretes prepared from four of the cements developed in 24 hrs. strengths in excess of 2800 lb. per sq. in., and the lean concretes from two of the cements gave strengths beyond 1500 lb. at the same period. Consistent gain in strength was obtained up to 1 yr., when one of the cements in the rich concrete gave a strength of 8220 lbs. per sq. in. Test pieces stored in water tended to show retrogression in strength with age. This was also noted with test pieces stored in the damp closet, but to a much less degree. This action may be explained by the fact that the products of the hyd. of all the aluminates are a hydrated $3CaO.Al_2O_3$ and hydrated alumina (except in the case of the anhydrous $3CaO.Al_2O_3$, when no hyd. alumina is produced). This latter is the cementing agent in these products, and, being colloidal, it is very susceptible to moisture changes. Large amts. of moisture are taken up in the presence of the latter with consequent swelling of the colloid and reduction in strength. H. F. S.

106. Potash shales of Illinois. M. M. Austin and S. W. Parr. *J. Ind. Eng. Chem.*, **13,** 1144–46(1921).—(1) In at least two localities in Illinois, shales occur which contain 5 per cent or more of potash. (2) Shale outcropping in several places near Jonesboro, in Union County, which contains 5 per cent of potash would be suitable, so far as can be determined from its chem. compn. and physical character, for use in the manuf. of *Portland cement.* (3) By using this material in the manuf. of cement and by applying the known methods of potash recovery, a yield of 5.3 lbs. of potash per barrel of cement could be obtained. (4) The constitution of the southern Illinois shale is complex. The shale contains free oil, bituminous matter, pyrite, undecomposed potassium-bearing rock, feldspathic in character, and potassium-bearing material

of the nature of glauconite or greensand. (5) Shale from Dixon, Lee County, contains 5.8 per cent of potash, which is held for the most part in a more stable condition than that in the southern Illinois shale. ED.

PATENTS

107. Floor-coverings. M. ROBERTS. Brit. 162,514, Apr. 6, 1920. A jointless floor covering is made by mixing calcined magnesite with an equal wt. of sawdust, cork dust, or wood pulp moistened with $MgCl_2$ soln. adding 5–10% of French Chalk and $12^1/_2$% of coloring matter, and subsequently adding $MgCl_2$ soln. at 28° Bé. till the desired plasticity is obtained. The coloring matter may be omitted. According to the provisional specification, asbestos may also be used as an ingredient. (*C. A.*)

108. Portland cement and calcining kiln. JOHN NELSON. Can. 212,734, Aug. 2, 1921. (*C. A.*)

BOOK

109. Portland Cement. RICHARD K. MEADE. Its Composition, Raw Materials, Manufacture, Testing and Analysis. 2nd Ed., Easton, Pa.: The Chemical Publishing Co. 512 pp. $5.00. (*C. A.*)

See also No. 4.

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Vol. 1 MARCH, 1922 No. 3

Ceramic Abstracts

Edward W. Washburn, Editor
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General and Miscellaneous

1. Osmosed clay. H. HIRSCH. *Tonind. Ztg.*, **45,** 1243–45(1922).—In a trough-like compartment of the electrosmotic separator are two stirrers which keep the clay agitated. Above these is a slowly revolving drum which is charged positively with an electric current. A few inches below the drum is a wire screen which is negatively charged. The impurities which are positively charged are caught on the screen and washed away while the clay which is negatively charged is attracted to the drum where it is dewatered by electrosmosis and is scraped off by means of long knives into trucks. The clay to be treated by this method is first subjected to a preliminary treatment similar to that used in this country. The clay is blunged with water and electrolytes and slowly passed thru troughs in which the quartz and mica are removed. It is then screened thru vibrating screens and passed over electro magnets and finally passed into large settling tanks. The slip is allowed to stand in these tanks sufficient to remove more of the impurities. The slip remaining in suspension is then run thru the electrosmotic machines of which the Westwälder works has 8. Each machine has a capacity of 8 tons per 24 hrs. A filter press operated on the electrosmotic principal is also described. The raw clay in this case contained considerable quartz and pyrites, and about 60–66% clay substance and had a softening point of cone 31. The osmosed clay contained above 90% clay substance, had a softening point of cone 33 and a much lower vitrification point than the untreated clay.

H. G. SCHURECHT

2. Ceramics as a by-product of coal mining in Sweden. J. W. BECKMAN. *Chem. Met. Eng.*, **25,** 882.—The thickness of the coal seams in the industrial center of Höganäs, Sweden, varies from 30 to 60 cm. In between the coal seams there are clay and carboniferous slates. These clays have to be mined simultaneously with the coal to make it economical and feasible to bring it out. The clay-products manufacture is now the main operation at Höganäs. The clay, originally a waste product, has become of prime importance, and the quality of the products produced from it has become famous not only in Sweden but in many other countries. *Firebricks, paving bricks, common building bricks, chemical ware, acid proof bricks, terra cotta products, sewer pipes, sanitary ware and household articles are all being made.* The carbonaceous shales are piled in the open and set on fire. They burn completely, leaving a dense well-burned chamotte which is very desirable for the manuf. of pressed brick and other clay products. The company operating the works at Höganäs also operates an elec. furnace plant at Trollhättan, where *alundum* and *carborundum* are produced, and these products are used here as elsewhere in the manuf. of *highly refractory bricks.* Electrodes are also a product of this plant, their manuf. being virtually a cer. industry, though utilizing different raw mats.

H. F. S.

3. Blasting with liquid air. SPIELMAN. *Tonind. Ztg.*, **60,** 519(1921).—Discussion as to possibilities for replacing blasting powder and dynamite. Theoretically 1 kg. liquid air possesses as much energy as 2.2 kg. gelatine

dynamite. Found to be impracticable for quarrying purposes. Suitable for mining, but uneconomical owing to necessity of too large scale production, transport and storage difficulties. WM. M. CLARK

4. Method of burning salt glazed ware. W. SCHUEN. *Tonind. Ztg.*, **54,** 454(1921).—Describes process as carried out by the author. WM. M. C.

5. Contraction of some quaternary (ceramic) mixtures fired to different temperatures. H. S. NEWMAN. *Trans. Ceram. Soc.*, **19,** 132–39(1919–20).—Slabs were prepd. from ball clay, china clay, stone, and flint in varying proportions, and some of each batch were fired in a saggar to cones 1*a*, 6*a*, and 8. Half were then dipped in a lead glaze and half in a leadless glaze and fired to cone 3*a*. The contraction at cone 016 was less in the majority of cases than the dry contraction, showing that at a certain temp. there is an expansion, probably due to the liberation of combined H_2O. Until the proportion of stone to flint falls below 3:2 the replacing of ball clay by china clay raises the contraction, and after this proportion is passed the reverse action takes place at the temp. of cone 1*a*. For cones 6*a* and 8 the proportion of stone to flint must be below 2:3 before the reversion occurs. The contraction does not always rise with the temp., but with some mixts. it reaches a max. and then falls again. The gradual substitution of one clay for the other, with the other materials remaining const., does not have a direct bearing on the contraction nor does the change from stone to flint while keeping the clays const. A large variation can be made in the proportions of ingredients used without affecting the working properties or causing crazing or peeling.

J. S. C. I.

6. Effect of added feldspar on the shrinkage and porosity of aluminous fireclays after being fired at high temperatures. E. M. FIRTH AND W. E. S. TURNER. *J. Soc. Glass Tech.*, **4,** 392–400(1920).—In a previous paper (*C. A.*, **14,** 3514) the authors had noted that, of clays which they examd., those of high Al_2O_3 content showed, with two exceptions, the widest range of porosity on firing. It is now shown that if 1 or 2% of feldspar is added to the two exceptional aluminous clays (to act as a flux during firing) the shrinkage is rendered more uniform, and there is a considerable increase of porosity range.

J. S. C. I.

PATENTS

7. Artificial meerschaum. P. DEUSSING. Brit. 164,319, May 25, 1921. Artificial meerschaum consists of Hallic earth, raw Meissner clay, whitening, and quartz dust. The Hallic earth may be replaced by roasted Meissner clay, and feldspar, MgO, or potash may be added to increase the flexibility of the mixt. The ingredients, after being separately pulverized, are ground together with H_2O into a semi-liquid paste which is cast in dry gypsum molds. After a few minutes, the still liquid portion is removed from the mold leaving a hollow casting, which is dried in the mold, roasted and oiled or waxed. An example of proportions is 30 pts. by wt. of Hallic earth, 10 of Meissner clay, 4 of whitening, and 8 of quartz dust, to which 50 pts. of H_2O are subsequently added. (*C. A.*)

Apparatus and Instruments

8. The Tyndallmeter reading of soil dispersoids. F. M. Scales and Franklin W. Marsh. Bureau of Plant Industry, U. S. Dept. of Agriculture, Washington, D. C. *Jour. Ind. Eng. Chem.*, **14**, 52–54(1922).—A method is described whereby the conc. of the colloid in a clay can be approx. and rapidly detd. by shaking up the clay with water, allowing it to settle and measuring the strength of the Tyndall beam. Ed.

9. High temperature studies. XIII. The measurement of vapor pressures at high temperatures and the vapor pressures of alkali halides. O. Ruff and Susanne Mugdan. *Z. anorg. allgem. Chem.*, **117**, 147–71(1921); cf. *C. A.*, **13**, 3054.—By measuring the loss in wt. of the substance held at temps. first slightly above that at which the phenomena of boiling are first noticed, and then at somewhat higher temps. and for different pressures, it is possible to det. the vapor pressure of solids at high temps. The temp. may be reached in a Heraeus furnace with Ni-wound tubes for temps., up to 1200° and in a C resistor furnace for high temps. Temp. is measured with an optical pyrometer for which calibration data are given. During the course of a detn. N is passed through the system at such a rate as to keep its pressure practically const. The container or boiling flask depends on the substance under examn.; for metals, which have a relatively high surface tension, it may be of porous C or graphite; for salts, which have a lower surface tension, optically opaque quartz (opaque at the temp. used) is better. For metals these containers should not have a capacity greater than 0.2 cc. while for salts 0.6–0.7 cc. is necessary. The method was checked up using previously obtained data on the vapor pressures of As, Sb, Bi, and Cu, all of which data are included in the article. Using this method then, the vapor pressures of the alkali halides were detd. The data cover from 7 to 9 points on the curve and the vapor pressure range is from 40 to 60 mm. up to the b. p. The heats of vaporization and the crit. temps. are calcd. Finally, a comparison is made between the obs. values and those calcd. by the Ramsay-Young rule; the latter is shown not to hold exactly. E. H. D. (*C. A.*)

Chemistry, Physics and Geology

10. The swelling and gelation of gelatin. Robt. H. Bogue. Mellon Institute, Pittsburgh, Pa. *Jour. Ind. Eng. Chem.*, **14**, 32–35(1922).—A study of the degree of swelling, viscosity, alcohol number and *pH* value upon gelatin mixed with sodium silicate, in which the ratio of Na_2O to SiO_2 was varied between 1:4 and 1:1. Ed.

11. The transition of quartz into tridymite. Pulfrich. *Tonind. Ztg.*, **45**, 1127–28(1921).—A summary of the observed facts regarding the influence of various substances upon the velocity of transition. Cf. *Jour. Am. Ceram. Soc.*, **4**, 421. H. G. Schurecht

12. Some unsaturated silicon compounds. H. Kautzky. *Z. anorg. allgem. Chem.*, **117**, 209–42(1921).—The action of HCl on $CaSi_2$ results in the

formation of a mixt. of 3 substances. In order to obtain them pure, the action of alc. HCl, contg. varying amts. of aq. HCl, was studied. Very dil. HCl contg. a large excess of alc. yielded a white, very little sol. cryst. substance of the compn. Si_2H_2O, to which the name *oxydisiline* is given. It has the following properties: Stable to 140°; at higher temps. it is decomposed into gaseous products readily inflammable in air; H_2O decomposes it slowly, more rapidly in heat or light, yielding a self-inflammable gas and H; alkalies and aq. NH_3 cause the reaction to become violent; dry NH_3 reacts above 0° to give nitrogenous compds. which with alc. yield org. Si compds.; it is a vigorous reducing agent—HNO_3 and H_2O_2 react explosively, H_2SO_4 is reduced to H_2S, P_2O_5 to PH_3 in the presence of alc. and many metals are precipitated from solns. of their salts. Treatment of well cooled Si_2H_2O, suspended in CS_2, with a dil. CS_2 soln. of Br gives the yellow compd. *silical bromide*, $(Si_2OH)Br$, so named because it is derived from the new radical, *silical* (Si_2OH). Oxydisiline can be converted into silical derivs. by the action of Cl, $CHCl_3$, CCl_4, C_2H_5I, aq. HCl, H_2SO_3. By hydrolysis of silical bromide, K. prepared dark brick-red *silical hydroxide*, $(Si_2OH)OH$, which is a base forming yellow, readily hydrolyzed *salts* such as halides, sulfate, phosphate, formate and acetate. No solvent for any of the silical compds. was found. These compds. can be oxidized to silicic acid, which is the third product referred to above. The supposed compd. "silicone" obtained by Wöhler (*Ann.*, **127,** 264(1863)) and by Hönigschmidt (*C. A.*, **4,** 30) as a result of the action of aq. HCl on $CaSi_2$ is undoubtedly a mixt. of the 3 substances isolated by K. Analytical and crystallographic data are given in some detail and it is pointed out that the oxydisiline, the silical compds. and finally the silicic acid are pseudomorphs of the original $CaSi_2$. The structures, $Si_2OH.H$ and $Si_2OH.X$, are proposed for the oxydisiline and the silical compds., resp., but it is suggested that the salts of the latter may be oxonium compds. of the type $Si_2O.HX$. For the unsatd. character of these Si compds. no satisfactory explanation is given; they may be analogous to compds. of bivalent C. E. H. Darby
(*C. A.*)

13. Indian bauxite. Anon. *Tonind. Ztg.*, **64,** 551, 552(1921); *Chem. Trade J. and Chem. Eng.*, **2,** 4, 441(1921).—Describes compn., occurrence, applications of bauxite. The Indian deposits were discovered in 1907, and promise to be an important source of pure bauxite in the world trade.
Wm. M. Clark

14. Binary systems of lithium orthosilicate with zirconium orthosilicate and with calcium orthosilicate. Robert Schwarz and A. Haacke. Freiburg i. B. *Z. anorg. allgem. Chem.*, **115,** 87–99(1921); cf. *These Abs.*, **1,** 6(1921).

15. Basic exchange in silicates. III. E. Ramann and H. Junk. *Z. anorg. allgem. Chem.*, **114,** 90–104(1920).—In continuation of previous work (*C. A.*, **11,** 2174; **14,** 256), the formation of Mg permutite by the action of Mg salts on NH_4, Na, and K permutites has been studied. As in other cases, the reaction is ionic, and there is no evidence of physical adsorption. Pure

Mg permutite could not be obtained, not more than half of the bases present in the original permutite being displaced by Mg. The whole of the NH_4 in NH_4 permutite could not be displaced by treatment with carnallite or kainite solns. Mixed salt solns., decompose the permutite to some extent, especially solns. contg. Mg or NH_4. This observation may have some bearing on the decompn. of natural silicates, which can not always be adequately accounted for by the action of water and H_2CO_3. J. C. S.

16. Corundum. A. L. HALL. Geol. Survey, *Mem.*, **15**(1920) (Dept. Mines and Industries Union of S. Africa); *Bull. Imp. Inst.*, **19**, 93–4(1921).—The Transvaal corundum deposits are said to be the largest and most important yet discovered. It is concluded from the geological relationships that the corundum has originated from an excess of Al_2O_3 occasioned by some of the SiO_2 in pegmatites of granitic origin being abstracted by the basic rocks into which the pegmatites have been intruded. R. L. S. (*C. A.*)

17. Magnesite. A. G. MAITLAND. W. Australia Geol. Survey, *Mem.*, No. **1**; *Bull. Imp. Inst.*, **19**, 100–1(1921).—Analyses of 8 samples of magnesite from 5 different deposits in W. Australia show MgO from 44.31 to 47.36% and CO_2 from 47.76 to 51.69%. The magnesite is found on the surface as an alteration product of serpentinized rock. R. L. SIBLEY (*C. A.*)

18. Researches in the chemistry of the silicates. F. M. JÄGER AND H. S. VAN KLOOSTER. *Sprechsaal*, **52**, 256(1919); *J. Soc. Glass Tech.*, **3**, 234–6.—The silicates were prepd. by first heating a mixt. of quartz and the metal carbonate or oxide to the sintering point in an Ir-free Pt dish in an elec. oven, and then completing the fusion in a Fletcher gas furnace. The silicates of Ba, Sr, Be, Zn, and Cd were white and cryst.; that of Zn showed a blue to violet coloring, while those of Mn developed a brown color. In the following table are stated some of the properties of the silicates. n_1 and n_2 are the refractive indices for uniaxial crystals, and n_1, n_2, and n_3 for biaxial. It was found that the meta-silicates have m. ps. which are related linearly to the at. wts. of the metals, the m. ps. rising with increasing at. wts. in the case of Ca, Sr, and Th, and falling with Mg, Zn, and Cd.

Substance	M. p.	Sp. gr.	Refractive indices	Special remarks
$BeSiO_3$[1]	>1750°	—	— — —	———
$MgSiO_3$[2]	1554°	3.175	$n_1=1.641$; $n_2=1.648$; $n_3=1.663$.	———
Mg_2SiO_4	1750°	—	— — —	———
$CaSiO_3$[3]	1540°	—	$n_1=1.609$; $n_2=1.650$.	———
Ca_2SiO_4[3]	2130°	3.27	$n_1=1.714$; $n_2=1.720$; $n_3=1.737$.	———
$SrSiO_3$[4]	1578 ± 1°	3.652	$n_1=1.620$; $n_2=1.590$.	The melt can be supercooled to 1225° when sudden rise of temp. to 1364° accompanied by crystn. takes place. By rapid cooling of the melt, an almost isotropic glass can be obtained with $n=1.618$, sp. gr. 3.540, and by careful heating a micro-crystalline variety is obtained.
Si_2SiO_4[4]	>1750°	—	— — —	
$BaSiO_3$[4]	1604°	4.435	$n_1=1.670$; $n_2=1.667$.	———

$BaSiO_4$[4]	1750°	—	—	—
$ZnSiO_3$[4]	1437 ±1°	3.52	$n_1 = 1.623$; $n_2 = 1.616$.	Small, weakly double refracting cystals. Attempts to obtain the substance as a glass were unfruitful.
Zn_2SiO_4[4]	1509°	—	$n_1 = 1.719$; $n_2 = 1.697$.	Weakly double refracting crystals.
$CdSiO_3$[4]	1242°	4.928	Both > 1.739.	Crystals identical with *Willemite*.
Cd_2SiO_4[4]	1252–1243°	—	Both > 1.739.	Crystals with strong double refraction.
$MnSiO_3$[4]	1273 ±1°	3.716	$n_1 = 1.739$; $n_2 = 1.733$.	Crystals with strong double refraction.
Mn_2SiO_4[4]	1290–1300°	4.044	Both > 1.739.	Artificial *rhodonite*.
$CaMG(SiO_3)_2$[5]	1391°	3.275	$n_1 = 1.664$; $n_2 = 1.671$; $n_3 = 1.694$.	Artificial Mn_2SiO_4 has no fixed m. p. Became dark colored on heating through decompn.

[1] Observers: Jäger and van Klooster.
[2] Observers: Allen and Wright.
[3] Observers: Day, Allen, White, Shepherd and Wright.
[4] Observers: Jäger and van Klooster.
[5] Observers: Allen and White.

(*C. A.*)

19. The introduction of silicic acid into the nucleus of complex compounds. Robert Schwarz and Hans Bausch. *Ber.*, **54**, 802–813(1921).—Among the more credible theories regarding the constitution of the Al silicates is that of W. Vernadsky, namely, that they are hydrates or salts of complex alumino-silicic acids. To cast light on the problem of the constitution of the *silicates*, the authors have studied the reactions of Na_2SiO_3 with complex compds. of known constitution, namely, hexamminocobaltic chloride, and chloropentamminocobaltic chloride. 1.25 g. Na_2SiO_3 in 50 cc. H_2O reacts with 2.5 g. $[Co(NH_3)_5Cl]Cl$ in 500 cc. H_2O to form *tetrasilicato-chloro-triammino-cobalt* $[Co(NH_3)_3Cl(Si_4O_9)]$. When dry, this is a reddish violet, fine, noncryst. powder. Heated at 120° it leaves marine-blue *cobaltous tetrasilicate*, $CoSi_4O_9$. It does not react with H_2O or cold dil. HCl, but hot HCl decomposes it, setting free all the SiO_2. Hot, strong NaOH soln. decomposes it with the sepn. of $Co(HO)_3$, which reaction was used in the quant. analysis of the compd. 50 cc. 2% soln. of Na_2SiO_3 and 2.5 g. $[CO(NH_3)_6]Cl$ in 500 cc. H_2O react forming a yellow-orange ppt. of *silicato-tetrammino-cobaltic chloride*, $[Co(NH_3)_4(Si_4O_9)]Cl$, which can be freed from small amts. of adsorbed H_2O only at 105° and with accompanying decompn. It is insol. in H_2O, is decomposed by dil. mineral acids, and even slowly by warm AcOH, setting free SiO_2. Heated, it decomposes according to the equation, $[Co(NH_3)_4(Si_4O_9)]Cl = CoSi_4O_9 + 4NH_3 + Cl$. Inasmuch as this silicato-complex is a cation, silicates of it should exist under suitable conditions. The reaction between 2.5 g. $[Co(NH_3)_6]Cl$ in 500 cc. H_2O and 2.5 g. Na_2SiO_3 in 50 cc. H_2O yields a yellow ppt. of *silicato-tetrammino-cobaltic silicate*, $[Co(NH_3)_4(Si_3O_7)]_2SiO_3$. This is the first synthetic silicato-silicate which has been prepd., and may be of interest in the interpretation of many reactions of the natural Al silicates. This compd. is decomposed by acids. When decomposed by heat, the product is not a simple substance. It was impossible to effect a sepn. of the Si within the nucleus from that in the SiO_3 anion. When the luteo-base, $[Co(NH_3)_6](OH)_3$, was treated with a suspension in H_2O of dioxo-disiloxane, $Si_2H_2O_3$,

there was formed the complex base, $[Co(NH_3)_4(Si_4O_9)]OH$, in which case the Si has entered the nucleus instead of forming a silicate with the complex as the cation. These facts add probability to the theory that many of the Al silicates are not silicates, but silicato-compds. in which Si radicals are coördinatively bound to the Al along with aquo–, oxo– and other groups, forming complex nuclei. The above compds. can be prepd. smoothly and free from by-products only by using cryst. Na_2SiO_3 and adhering strictly to the quantities and concns. specified in the article. R. H. LOMBARD (*C. A.*)

20. Siliconhydrides X. Nitrogen-containing compounds. ALFRED STOCK AND KARL SOMIESKI. *Ber.*, **54,** 740–58(1921); cf. *Jour. Am. Ceram. Soc.*, **4,** 1004.—The authors have studied the action of NH_3 on SiH_3Cl and SiH_2Cl_2. These reactions give N derivs. of monosilane which contain the groups SiH_3 and SiH_2, and many of which are volatile, simple mol. substances. These compds. form a new basis for the comparison of Si- with C-chemistry. Differences and similarities between the Si-N compds. and the analogous C-N compds. are discussed. *The preparation of* SiH_3Cl (b. p.—30°) *and of* SiH_2Cl_2 (b. p. 8°), which were used as starting substances in this research, is described. R. H. LOMBARD (*C. A.*)

21. On plastic flow through capillary tubes. E. BUCKINGHAM. *Proc. A. S. T. M.*, **21,** 1154–57(1921).—As the formula of Bingham and Green is only a very rough approx., the author math. develops the more exact formula for a steady flow through a long round tube and for the vol. rate of discharge. The effect on the vol. rate of discharge formula due to the introduction of Green's hypothesis of viscous slip is also given, together with a graph of the discharge curve. To reduce the importance of slip it is necessary to use large tubes. E. N. BUNTING

22. A study of elastic viscous deformation. P. G. NUTTING. *Proc. A. S. T. M.*, **21,** 1162–68(1921); *Frank. Inst. J.*, **191,** 679–85(1921).—A simple instrument which measures the force necessary to pull out a rod at a given rate from the mat. under investigation was used to study the viscous behavior of asphalt, stearine, pitch, hydrolene, and a mixt. of Tarvia X + MgO. It was found that the laws of viscosity ordinarily assumed did not in general apply, as the shearing strain is not in general proportional either to the shearing stress or to the time it is allied. The relation found to hold between stress s, time t, and stress or force F is given by $s = at^nF^n$, where a, n, and m are constants. This reln. includes as special cases relns. ordinarily assumed to hold for elastic solids ($n = 0$ and $m = 1$, Hooke's Law) and for viscous fluids ($n = 1$ and $m = 1$) and clears up the many difficulties and inconsistencies often encountered in viscosity measurements. Melting, softening, dropping, and other thermal points may be exactly defined by means of this new formula by assigning sp. values to any or all of the constants a, n, and m, while measuring s, t, and F in specified units. It is pointed out in the discussion, however, that the mats. investigated are plastic and that the laws of plastic bodies, which have not as yet been very well formulated, might not be the same as the viscosity law. E. N. BUNTING

23. An elutriation test for potters. B. Moore. *Trans. Cer. Soc.*, **20,** 112–19(1921).—The app. is a one-can elutriator of the Shöne type with straight side and a cross-section of 34.47 inches so that a flow of one pint per min. gives a velocity of one inch per minute. The author believes the mean diam. of the coarser particles in elutriation tests have been estimated too high and consequently the surface factors have been too low. Emphasis is laid on the known fact that the sp. gr. of the mat. being elutriated is an important factor in detg. the size of particles that will be carried by a stream of given velocity. H. F. S.

24. Silica in 1920. L. M. Beach. U. S. Geol. Survey, *Mineral Resources of U. S., 1920,* Part II, 151–2(preprint No. 17, published Oct. 11, 1921). E. H. (*C. A.*)

25. Crystalline magnesite at St. Martin, Salza. Franz H. Ascher. *Z. prakt. Geol.*, **1917,** 66–9.—Pure, cryst. magnesite occurs at St. Martin on the Salza, 4 km. from Öblarn in Obersteiermark. Analyses of the mineral are given. It occurs in a bed averaging 15–20 m. thick and extending over a distance of 1100 m. E. F. Holden (*C. A.*)

26. Mineral resources of the state of New York. David H. Newland. *N. Y. State Mus. Bulls.*, Nos. **223, 224,** 307 pp.(1919).—"This report is intended to serve the purpose of a general guide to the mineral resources of New York. It presents the principal facts regarding the character, occurrence and production of the useful minerals, with reference to particulars of the local features that bear upon their industrial utilization." For the year 1918 the value of *Portland cement, brick, pottery, other clay products, gypsum,* Fe ore, natural gas, petroleum, salt, sand and gravel other than molding sand, and limestone was over $1,000,000 each; the range being from 1.4 to 7.3 million dollars. The value of garnet, *graphite,* mineral waters, pyrite, *molding sand,* marble, sandstone, trap, granite, *talc,* and Zn ore ranged from $135,000 to $902,000. The total value of the mineral products for 1918 was over 54 million dollars. More than 100 chem. analyses of various mineral samples are recorded. L. W. Riggs (*C. A.*)

27. Feldspar. Arthur S. Watts. *Mineral Ind.*, **29,** 226–27(1920).—Production figures and a list of grinding mills are given. A. Butts (*C. A.*)

28. Garnet. D. H. Newland. *Mineral Ind.*, **29,** 10–11(1920).—A discussion of the sources, use, market and production of abrasive garnet. A. Butts (*C. A.*)

PATENT

29. Soluble silicates. F. J. Phillips. Brit. 163,877, April 9, 1920. Sol. silicates of high SiO_2 content are prepd. by dissolving silicic acid in alkali silicate solns. obtained by fusing SiO_2 and alkali, or SiO_2, alkali, and borax, and treating the cooled and broken melt with H_2O. The silicic acid is prepd., *e. g.*, by adding H_2SO_4 to cold water-glass soln., and after dialysis is dissolved in the silicate soln., by continued griding or agitation. Cf. 151,508 (*Jour. Am. Ceram. Soc.*, **4,** 317) and 151,399 (*C. A.*, **15,** 2699). (*C. A.*)

Refractories and Furnaces

30. Report of Committee C-8 on refractories. R. C. Purdy and W. H. Fulweiler. *Proc. A. S. T. M.*, **21,** 315–16(1921).—The present tentative method for ultimate chem. anal. of chrome ores and chrome brick has been adopted as standard by the Society. A proposed method of test for resistance of fire-clay brick to spalling action has been adopted as tentative. Investigation of conditions under which refractory mat. are used in the steel industry is practically completed. A study on microstructure is also under way. E. N. Bunting

31. Tentative method of test for resistance of fire-clay brick to spalling action. Anon. *Proc. A. S. T. M.*, **21,** 577–78(1921).—The object of the test is to detn. the resistance to spalling action by subjecting the brick to repeated rapid temp. changes. Instruction for the prepn. of samples and the detailed procedure are then given. E. N. Bunting

32. Refractory brick for blast furnaces. Anon. *Brit. Clayworker*, **30,** 3(1921).—The brick should meet the following requirements: (1) resist. to abrasion, (2) resist. to the chem. action of slags, metals and gases, (3) resist. to high heat and (4) resist. to sudden temp. changes. The fire boxes and bottom of the furnace should be lined with brick having the compn. 63% Al_2O_3 and 37% SiO_2 and should be fired at 1300° C. H. G. S.

33. The importance of air supply in combustion of coal. Henry Kreisinger. *N. J. Ceramist*, **1,** 39(1921).—A general discussion of the processes of combustion and their control in the opern. of hand-fired furnaces. C. W. Parmelee

34. Application of coal in burning brick. J. Weiss and Dr. Ing. H. Becker. *Tonind. Ztg.*, **48,** 396, 397; also **56,** 469, **58,** 491(1921).—Describes many different types of ring furnaces with illus., and their advantages and efficiency. Wm. M. Clark

35. Short and long flames in gas firing. M. Kruss. *Tonind. Ztg.*, **53,** 443(1921).—Concludes that short flames result when gas and air are instantaneously mixed at the burner and long flames when a gradual mixture of gas and air takes place. Wm. M. Clark

36. Unburned fire proof blocks. Paul Schneider. *Tonind. Ztg.*, **49** 405, 406; also **52,** 434, **54,** 452, 453, 454(1921).—Detailed description of expts. with different mixts., influence of sizes of ingredients and effect of CaO, SiO_2, etc. Wm. M. Clark

37. Electric furnaces for melting glass. O. Maetz. *Chem. Zentrblt.*, **25,** 709(1920); and *Sprechsaal*, **53,** 420(1920).—Describes arc type furnaces used in Sweden by A. B. Elektriska, Ungar, Stockholm. Wm. M. Clark

38. Sintered dolomite. Anon. *Tonind. Ztg.*, **53,** 492(1921).—Description of the dead burned product and amount of bond required. Concludes that for the Siemens-Martin Steel Furnace the best sintered dolomite contains 3% Al_2O_3 and Fe_2O_3 and 2.5% SiO_2. Wm. M. Clark

39. Extraction of calcium oxide from calcined magnesite. L. H. Duschak. *Chem. Met. Eng.*, **23,** 628(1920).—CaO may be almost completely

extd. from magnesite after calcining at 900°–950° by leaching for several hrs. with water free from CO_2. If the magnesite has been calcined at higher temps., and especially if it is "dead burnt," the extn. is very incomplete and is not improved by fine grinding probably owing to the formation of an insol. compd.

J. S. C. I.

40. Electric-furnace purification of zirkite. J. G. Thompson. *Trans. Am. Electrochem. Soc.*, **40,** preprint(1921).—Zirkite ore was treated in elec. furnaces to remove the Fe, Si, Ti, and other impurities usually associated with it. It was found that the temp. required was too high for a resistance furnace. With an arc furnace 90–95% of the Si could be removed by heating the ore to 2220° or higher, provided coke was added in just the proper amt. to transform only the Si to carbide. The existence of stable double carbides of Si and Zr, or of solns. of SiC in solid ZrC, is suggested as an explanation of the incomplete removal of the Si when an excess of C is present. The further treatment of the ore with Cl or $COCl_2$ to remove the Fe is suggested.

W. E. Ruder (*C. A.*)

41. Investigations of zirconium with especial reference to the metal and oxide. J. W. Marden and M. N. Rich. *Bur. Mines, Bull.* **186,** 146 pp. (1921); cf. *Jour. Am. Ceram. Soc.*, **3,** 765.—The work is divided into four parts, dealing successively with an historical review of Zr minerals, the salts of Zr, and the metal; exptl. work on Zr; the furnaces used; and a bibliography of Zr and its compds. Analytical methods are given for detg. Zr in ferrozirconium, steel, alloys such as Ni-Zr, and a method of sepn. of Ti, Cb, Ta and Zr. The phys. and chem. properties of amorphous and coherent Zr are fully listed. The cupferron method is the only one effecting complete sepn. of Zr and Al.

W. H. Boynton (*C. A.*)

42. The possibility of preparing high-grade silica bricks from quartzite rock. E. Lux. *Stahl u. Eisen,* **41,** 258–64(1921).—Good silica brick can be made from quartzite rock provided a sufficiently high burning temp. is used.

R. S. Dean (*C. A.*)

43. Physical characteristics of specialized refractories. IV. M. L. Hartmann and W. A. Koehler. *Trans. Am. Electrochem. Soc.*, **40,** preprint (1921); cf. *Jour. Am. Ceram. Soc.*, **3,** 582; *ibid.*, **4,** 239; *ibid.*, **4,** 165.—The cross breaking strength of each of 10 refractories was detd. at 20° and 1350°. Within this temp. range chrome brick showed the most decided drop in modulus of rupture followed by bauxite, MgO, fire clay and SiO_2. Chrome bricks at 1350° have a breaking strength $^1/_{63}$ of their cold breaking strength. Two bonded SiC refractories showed an increase, indicating that the decrease occurs at a higher temp. than 1350°.

W. H. Boynton (*C. A.*)

PATENTS

44. Dolomite bricks. C. H. Breerwood. U. S. 1,380,701, June 7. Dolomite contg. a small amt. of Fe is ground very fine, burnt at a temp. sufficiently high to vitrify or amalgamate it, finely reground, compressed under high pressure and burned to form a vitrified brick adapted for lining kilns or steel furnaces.

45. Furnace linings. C. H. Breerwood. U. S. 1,380,700, June 7. A refractory material suitable for lining furnaces or for making crucibles is prepd. by introducing dolomite and Fe or similar material adapted to form a sinter in a finely divided condition into a furnace, mixing with it small pieces of coal tar, Fe, fire brick or other material to which the finely divided material adheres in its passage through the furnace to form balls, and continuing the heating for a sufficient time to aggregate the materials to the desired extent.

46. Electric furnaces. Morgan Crucible Co., Ltd and C. W. Spiers. Brit. 162,246, Oct. 7, 1919. Resistance tubes or crucibles are sepd. from a refractory outer wall by natural graphite in the form of flakes, which may be got by grinding the graphite and freeing it from dust; graphite of high C content should be used. Such flaky graphite, if loosely packed, has low elec. and thermal conductivity and is sufficiently elastic to allow expansion and contraction of the crucible, etc. Around the cooler part of the crucible, from the bottom terminal to a point within the casing, there may be placed a fine powder, such as sand or finely ground earthenware, to insulate the graphite from the terminal.

47. Automatic temperature control device for electric furnaces. A. L. Wilkes. U. S. 1,377,952, May 10.

48. Electric resistances. W. Travis, T. H. Watson and Co., Ltd. Brit. 163,727, Aug. 13, 1919. A resistance for an elec. furnace is protected against oxidation by a casing consisting of bonded and fired SiC or of fused Al_2O_3. The core may consist of a series of disks, plates, rings, etc., or powder or granules, of amorphous or graphitic C or carbonaceous material. It may be placed in a mold and a mixt. of powdered or granular carborundum and clay rammed around it. Heat may then be applied externally, or elec. current passed through the resistance, to form it into a solid mass. The mixt. may alternatively be applied as a paste, or may be separately molded to form the casing. (*C. A.*)

49. Refractory composition. H. H. Buckman and G. A. Pritchard. U. S. 1,375,077, Apr. 19. In the prepn. of refractory articles such as furnace linings, muffles or the like, zircon is used with a clay binder.

50. Refractory material. M. L. Hartmann. U. S. 1,376,091, Apr. 26. A refractory material is formed of carborundum with Zr silicate and Al silicate as bonding materials.

51. Refractory heat-insulating material. P. G. Willetts. U. S. 1,374,538, Apr. 12. A refractory material adapted for boiler settings or the like is formed by burning a mixt. of finely divided lignite coal and plastic fire clay having a high silica content.

See Abstract No. 25.
See Abstract No. 103.

Abrasives

52. Manufacture and use of coated abrasives. L. S. Greenleaf. *Tech. Eng. News*, **2**, 116–17(1921). Ed.

53. Artificial corundum. ANON. *Tonind. Ztg.*, **45**, 1135–36(1921).—In 1894 E. Moyat first made artificial corundum for the firm of Mayer and Schmidt. This mat. was free from many defects of the natural corundum and soon became widely used as an abrasive. About the same time Acheson discovered carborundum which also became popular as a refractory. The Moyat process for the manuf. of artificial corundum (Ger. pat. 85,021, 1896, class 12) was based upon the elec. melting of emery, bauxite, etc. and the reduction of impurities as Fe_2O_3, SiO_2 and TiO_2 with coal or charcoal. Al_2O_3 is not reduced by this process while the impurities are and as a result the impurities are reduced, float to the top and are easily picked off. The purified Al_2O_3 crysts. to brown to ruby crystals on cooling. During the war the production of this mat. became an important industry in Germany where it is known as "corraffin." H. G. SCHURECHT

See Abstract No. 119.

Stoneware, Whiteware and Porcelain

54. A method of determining the tensile stregth of porcelain. F. H. RIDDLE AND J. S. LAIRD. *Proc. A. S. T. M.*, **21**, 1050–56(1921).—Test specimens of two types, one with conical ends or shoulders, the other dumb-bell shaped, having cross-sections of 0.125–0.2 sq. in., were tested in an ordinary 2000-lb. Olsen cement testing machine provided with special grips. The specimens were prepd. by pugging and extruding rolls of suitable size, throwing rolls by hand, and by cutting large pugged and cast blocks. Different strengths were found for specimens prepd. in different ways and for comparative tests the specimens must be prepd. in a uniform manner. The specimens were glazed and burned in regular porcelain kilns. Warped specimens gave unreliable results. It was found that good triaxial porcelain has a tensile strength of 3000–6000 lbs. per sq. in., calculated from the breaking strength of specimens 0.4 in. diam. Special high temp. porcelains show strengths up to 10,000 to 12,000 lbs. per sq. in. It was found that the tensile strength is a function of the diam. and cross-section of the test specimen. Plotting breaking strengths against diam. of test specimens gives practically a straight line, expressed by the equation $S_1 = (d_1 - 1/4)\ \frac{S_2}{d_2 - 1/4}$, where S_1 = strength of specimen; d_1 = diam. of specimen; S_2 = strength of small test specimen; and d_2 = diam. of small test specimen. E. N. BUNTING

55. The firing of stoneware. S. E. *Keram. Rundschau.*, **29**, 401–402 (1921).—When CaO is present in stoneware bodies Ca compds. of low viscosity are formed and hence the bodies may deform easily at high temps. Mg compds. are more viscous and hence bodies contg. Mg do not deform as easily as those contg. Ca. For this reason bodies contg. considerable CaO can not be fired above cone 4*a*, while stoneware contg. feldspar instead can be fired to cone 9 or 10 without danger of warping. Stoneware clays should vitrify between cone 07*a* and 4*a*. The glaze should have a softening point

between cones 01*a* and 05*a* and should be basic or neutral. The basic glazes are not affected by sulphates as the acid are. It is advisable to avoid the use of fuel containing sulphates since sulpho silicates are formed with them causing the glaze to become dull. Finishing the burn with wood fuel instead of coal will remedy to some extent the ill effects of sulphates. H. G. SCHURECHT

56. Some unsolved problems in potting. ASHLEY MYOTT. *Trans. Cer. Soc.*, **20,** 39–46 (Presidential address).—Suggests need for more uniform quality in raw materials, for some new type of filter press pump that would give continuous pressure, and for standardization of cylinder grinding. Suggests the use of producer gas and fuel oil for firing, the reuse of old plaster, the development of an automatic casting process for cups, etc., the publication of an elementary treatise on firing, the printing of underglaze colors, the introd. of a size for lithography which can be gilded upon without defects becoming apparent on the gilt decoration, and the more general use of mech. transport. States that in his own plant the loss between clay shop and packing room has never been less than 16%, exclusive of seconds and thirds.

H. F. S.

57. Recent visit to some Spanish and Portuguese potteries. W. LINDLEY. *Trans. Cer. Soc.*, **20,** 72–82.—In the large pottery of Gilman, Ltd., located at Sacovem and devoted to making whiteware, neither flint nor Carnish stone are used, the body consisting of silica sand, feldspar and a very slight admixt. of china clay and ball clay. Practically all the ware has been fired for the last 10 yrs. in a car-tunnel kiln of the Faugeron type. This kiln has no muffle and the ware is fired in saggers with the use of wood as fuel, which seems especially suitable for this type of kiln. The kiln is 275 ft. long. A temp. of 1150°C is used for biscuit and 1050°C for glass. Saggers do not last as long in the tunnel kiln as in beehive kilns. The underglaze printed patterns were not "hardened on" but the oil was neutralized by the use of weak sulphuric acid. A leadless glaze was used with very good results. Tiles to be glazed were placed on a traveling belt which carried them under a coating roller which imparted just the requisite amount of glaze without smearing the sides. A "climax" kiln has been used as long as 15 months before having to be shut down for repairs. H. F. S.

58. Effect of calcination of flints on earthenware bodies. A. HEATH AND A. LEESE. *Trans. Cer. Soc.*, **20,** 121–126.—Keeping the wt. per pint of slop flint the same, the wt. of dry flint content may vary 12.8 %. This is due to the fact that the sp. gr. of the flint may vary from 2.6 to 2.2, according to the degree of calcination. When sand is used in pottery making in place of calcined flint, the biscuit firing must be carried to a higher temp.

H. F. S.

59. Thorpe's solubility ratio. J. W. MELLOR. *Trans. Cer. Soc.*, **20,** 120.—T. E. Thorpe proposed an empirical rule which gives a fair indication whether a lead frit is likely to have a low soly. The rule should read

$$\frac{\text{Sum of bases (including alumina)}}{\text{Sum of acids}} = 0.5 \text{ approx.}$$

where molecular proportions (bases unity) are understood. Thorpe's suggestion that the number be multiplied by the mol. wt. of lead oxide and divided by the mol. wt. of silica is quite arbitrary and unnecessary.

H. F. S.

60. Some notes on saggers. B. J. Moore. *Trans. Cer. Soc.*, **20,** 93–104.—Carborundum used as grog gave saggers with long life. The objections to the use of such saggers were: excessive cost, development of small cracks in the first firing, and excessive boiling when used with clays containing pyrites. They give better results in oxidizing than in reducing kiln atms. The author has used fused quartz, costing 50s per ton, as grog on a factory scale with great success. The clays used have been mixtures of ball and china clay, the relative percentages depending on the temperature. Saggers containing fused quartz as grog have a dull ring but do not dunt. The duller the ring, the longer they last. They do not stand rough handling well. Used in china biscuit oven, they have stood over 70 firings. H. F. S.

61. Further recent improvements in Swedish potteries. A. S. W. Odelberg. *Trans. Cer. Soc.*, **20,** 47–55.—A lecture, illusd. by moving pictures, covering equipment discussed in a former article (cf. *These Abs.*, **1,** 12). New points are: all china clay used is imported from England. Cylinder grinding has been employed for 30 yrs. Biscuit ovens are fired $^2/_3$ with coal and $^1/_3$ with wood. Wood alone could be used but the cost for labor would be higher, the flame would be reducing and the life of the saggers shorter. The kiln bats used in the enamel oven are made of fire clay while those generally used in Staffordshire are made of iron. During the summer saggers are dried in open sheds. H. F. S.

62. Stoneware machines, pumps and exhausters. Fr. Müller. Friedrichsfeld. *Z. angew. Chem.*, **34,** Aufsatzteil, 291–2(1921).—A general paper read at the meeting of the Ger. Chem. Soc. in Stuttgart. J. H. Moore (*C. A.*)

63. Moissen porcelain for pottery and chemical ware. W. Funk. *Z. angew. Chem.*, **34,** Aufsatzteil, 127–8(1921).—Klein (cf. *C. A.*, **11,** 287) concluded from a microscopic study that Royal Meissen porcelain was burned at a comparatively low temp. or heat treatment. Funk claims this to be erroneous.

C. H. Kerr (*C. A.*)

PATENT

64. Manufacture of hard porcelain for chemical and electrical purposes, etc. Otogorô Umeda. Japan 37,175, Sept. 28, 1920. Minerals partly or mainly composed of $MgSiO_3$, whose hardness is above 4, *e. g.*, enstatite, diopside, tremolite, jade, forsterite, serpentine, are mixed with clay of high purity. The operation is conducted as usual. (*C. A.*)

See Abstract No. 23.

Glass

65. Stained and painted glass. C. J. Connick. *Tech. Eng. News.*, **2,** 107–108(1921). Ed.

66. The Canadian glass industry. Anon. *Can. Ind. of Chem.*, **V,** 315(1921).—The products of the Canadian glass industry in 1918 were valued at the

factories at $6,578,602, while imports into Canada for 1918 of glass and glassware were valued at $5,430,873, exports amounting to $35,267. Nine plants were engaged in the manuf. of glass and glassware in Canada in 1918, with a total working capital invested of $7,443,525. The industry employed 2,215 workers. The industry used $2,056,739 of materials during the year, of which the chief items were: soda ash $635,068; limestone $18,076; lime $18,046; litharge and red head $17,764; arsenic (white) $8,694; boxes and cases $367,946. The production of the industry included lamp and lantern chimneys, tumblers, bottles, and other pressed and blown glassware made by six firms; phials and chem. glassware by two others; and window glass by 1 firm only. Of the glass imports the largest item is for common and colorless window glass $1,809,031; plate glass $1,031,440; carboys, decanters, flasks, jars and phials, $657,113.

ED.

67. The manufacture of constructional glass in the United States. E. WARD TILLOTSON, JR. *J. Soc. Chem. Ind.*, **40**, 155–9T(1921); *Nat. Glass Budget*, **37**, No. 16, 1–7(1921).—Descriptive of the Lubbers and Colburn processes for the mechanical production of window glass, and of the manuf. of plate, wire, and miscellaneous sheet glass. At present about $^1/_3$ of American window glass is still hand made. The Colburn machine is producing about $^1/_4$ of the total window glass requirements. By this method sheets of any thickness up to $^1/_4$″ can be drawn continuously, and it becomes a competitor in the plate glass industry as well as in the window glass. J. B. PATCH (*C. A.*)

68. The manufacture of iridescent glass. OTTO WILHELM. *Diamant*, **42**, 601–602, 619–20(1920); *Glass Industry*, **2**, 85–6(1921).—Glass may be made iridescent by either the wet or dry method. The former procedure subjects the glass to the action of 20% HCl at 120° under a pressure of 5 atms. In the dry method the glass is heated in a muffle and exposed to vapors of Sn chloride mixed with carbonates and nitrates of Sr, Ba and Cu according to the effect desired. Soft Pb and Na glasses give the best results.

J. B. PATCH (*C. A.*)

69. A new method of coating pearl beads. O. PARKERT. *Sprechsaal*, **52**, 23, 191(1919); *J. Soc. Glass Tech.*, **4**, 25–6.—Older methods of coating "pearl" beads were unsatisfactory on account of the ease with which the coating was rubbed off. Better results were obtained by coating the beads with hard varnish contg. the "fish silver," but the surface lacked the brilliance of the fire-polished glass. The present process suggested a method for producing the coating on the inside of the beads, thus being protected from abrasion. In the new method, a soln. was prepd. from dry "fish silver," copal varnish, mastic and acetone, possessing the property of rapid drying. The crystal glass beads were cleaned thoroughly with soda and dried. They were then placed in a glass bowl, so arranged and mounted that it could be rotated rapidly about an inclined axis. A portion of the soln. as above was added, the container closed by a rubber cover, and then rotated. After a short period the interior of the glass "pearls" was found to be coated evenly and regularly with the pearl silver, but the excess soln. was contained in the interior of the

beads as drops of liquid. To remove this, the cover of the vessel was taken off and the speed of rotation doubled, the vessel being gently warmed by a small flame. In a short time the liquid was evapd., and the coating adhered firmly to the inside of the beads. Aniline colors and lusters could be applied as interior coatings to beads in a similar manner. Cf. *C. A.*, **15**, 1976.

H. G. (*C. A.*)

70. The causes of loss in bottles during pasteurization and sterilization. A. W. Bitting. *Glass Industry*, **2**, 171(1921); *Glassworker*, **40**, No. 39, 21 (1921).—Mfrs. reported losses ranging from 0.1 or 0.2 to 3%. The Research Dept. of the Glass Container Association made tests on bottles of various sizes from 4 to 64 ounces capacity. The amount of head space or excess volume over rated capacity was found to vary disproportionately. With the smaller bottles the head space was about 12% of the total capacity, but with the 64-ounce bottles the head space was less than 5%. This extra vol. should be made dependent upon the expansion of the materials used where the containers are to be subjected to heat. The bottles were filled with tap water at a temp. of 60°F. When they were heated to a temp. of 100° the water had expanded 0.7%; 140°, 1.5%; 180°, 2.6%; 190°, 3.0%. The breakage was found to be much less in the case of the small bottles owing not only to the lower pressure generated (because of the relatively larger head space) but also to the fact that small bottles are inherently stronger than large ones. Tap water containing air gave a different result from boiled water. This would indicate a difference in pressure generated between processing cold fruit juices and those which had been previously heated in a kettle. It was recommended that bottles be preheated to 120°F or more before capping. J. B. Patch (*C. A.*)

71. Some calculations of glass technology. J. B. Krak. *Glass Industry*, **2**, 159–60(1921).—Very clear directions are given for figuring a batch from a glass analysis and *vice versa*. A useful table of factors is appended.

J. B. Patch (*C. A.*)

72. Heat transfer in tanks. Henry W. Seldon. *Nat. Glass Budget*, **37**, No. 10, 1–5(1921).—A disscussion of the combustion of producer and coke-oven gases, and of flame temp. J. B. Patch (*C. A.*)

73. German sources of silica useful in the glass industry. Hugo Kühl. *Gashütte*, **51**, 340–1, 389(1921).—K. gives 77 locations and analyses.

J. B. Patch (*C. A.*)

74. New method of setting regenerator chambers. G. Suchy. *Sprechsaal*, **52**, 247(1919); *J. Soc. Glass Tech.*, **4**, 165–6.—S. continued a discussion on the subject of regenerator chambers in which the checker work was built up on a series of carriages which could be withdrawn and replaced at will. The idea was not new but had never met with general acceptance. In the usual type of furnace—if the dampers were closed during filling-in and correctly regulated during founding, so as to avoid excessive draught—batch dust would not be drawn into the regenerators, and their subsequent stopping up or collapse would be hindered to such an extent that resetting should not be necessary for 1 to $1^1/_2$ yrs. After this period the regenerators should be

reset entirely. In a tank furnace conditions were different. Batch was filled in at hourly intervals and dampers were rarely altered, so that much more batch dust was drawn into the regenerators. The "new" system might be of advantage under these conditions, but as the chambers would have to be reset along their length the process would be very disagreeable. Glass from the siege could be prevented from leaking into the regenerators to a great extent by paying particular attention to the covering of the chambers. As the furnace grew older, however, cracks developed, and some glass frequently found a way into the chambers. To avoid this as far as possible, the following procedure was recommended. Before the first pot setting rake over the siege a dry mixt. of $^2/_3$ quartz sand and $^1/_3$ plastic clay to fill up all cracks. At each subsequent pot setting fill up all cracks or channels with the same mixt. made into a slip with water, and then cover with a liberal coating of sand. In this way the siege remained intact, and glass could not leak through. Soft glasses, such as the more fusible lime-soda glasses, could usually be made in furnaces depending chiefly on top heating, but for harder glasses, such as Bohemian crystal, bottom heat was essential. This could be attained by correct furnace practice. For instance, in the improved Siebert furnace, where the regenerators were close under the furnace, so soon as the second filling-in had melted down, the dampers should be lowered. The heat was driven upwards from regenerators and under-furnace, and the flames became clearer, and a steady, successful found resulted. Overflowing from the glass pocket into the chambers could be prevented by closing the pocket with a fire-clay stopper luted lightly with fire clay. When the glass pocket became too full, the fluid glass forced out the stopper and flowed into a special pit, thus obviating the arduous work of drawing the glass from the pocket. S. agreed that elliptical regenerator blocks were preferable to the ordinary form, but from experience preferred blocks 32 × 10 × 10 cm., on the ground that they distributed the heat more uniformly throughout the chambers.

H. G. (*C. A.*)

75. The new method of setting regenerator chambers. J. BALDERMANN. *Sprechsaal*, **52**, 363(1919); *J. Soc. Glass Tech.*, **4**, 166.—B. maintained that the system of setting regenerator chambers by means of movable carriages had proved efficient in practice. For each chamber 3 carriages were necessary, and all 4 chambers could be reset in 2 to 3 hrs., whereas in the case of badly fused chambers it took from 48 to 60 hrs. to put these into good order by the older method. With regard to other points raised in the discussion, the siege of the furnace could be maintained in much better condition by the use of grog than by using the sand-clay mixt. recommended by Suchy (preceding abst.), since well burned grog was not so readily attacked by the overflowing glass as were sand and clay, and consequently remained permanent, whereas sand and clay were dissolved by the glass, leaving exposed cracks and channels in the siege. Further, the pots did not bind so firmly to the siege when set on coarse grog as when sand is used. In a furnace with top-flame heating it was quite possible to melt a glass contg. 30 parts of soda to 100 parts of sand, or

even somewhat harder. The harder the glass the cheaper it was and the better the color. B. pointed out that if the dampers were closed during filling in the result would be that the flame would be driven out through the filling-in holes. He approved the idea of the automatic emptying of the glass pocket, but it remained to be seen whether this would work out well in practice.

H. G. (*C. A.*)

76. The simplex muffle leer. C. E. Frazier. *Nat. Glass Budget,* No. **2,** 1(1919–20); *J. Soc. Glass Tech.,* **3,** 267–9(1919); 2 figs.—The advantages of muffle *vs.* open leers are enumerated. The Simplex muffle leer is an improvement over other muffle leers owing chiefly to a flat rather than a curved arch. This construction is made possible by use of a cast iron support for the tiles so that each tile has only its own weight to support, reducing breakage and by making thinner walls possible increasing the amount of radiation and thereby the efficiency of the leer. J. B. Patch (*C. A.*)

77. Furnace for revolving pots. Anon. *Nat. Glass Budget,* **37,** No. 21, 1–2(1921).—A description of a test of a Chapman-Stein recuperator applied to an Owens revolving pot. The temp. of the waste gases entering the recuperator was 1550°F. The temp. of the air coming from the recupe ator was 1300°F. The temp. of the gases entering the stack was 650°F.[r] If the distance between the furnace and recuperator had been less the initial temp. of the waste gases would have been higher; nevertheless the figures show the efficient transfer of heat of the waste gases to the incoming air. The recuperator is said to be capable of maintaining a very const. temp. For 24 hours the temp. readings of the furnace showed a max. variation of 40° F from the mean temp. However, this is not nearly as close a regulation as is possible and not even as close as the engineers guarantee. In another test under different circumstances a max. variation of ±10°F was obtained. The Stein recuperator is said to be especially valuable in connection with pot furnaces. In Europe it has not only reduced the fuel consumption of such furnaces nearly 1/2 but it has also nearly doubled the av. life of the pots.

J. B. P. (*C. A.*)

78. The Mathews reverberatory furnace. Anon. *Nat. Glass Budget,* **37,** No. 18, 1, 20–21(1921).—A detailed description without diagrams of a recuperative gas-fired pot furnace, largely in the language of the patent

J. B. Patch (*C. A.*)

79. Comparative strength of prescription bottles. A. W. Bitting. *Glass Ind.,* **2,** 187(1921).—The results of tests upon 28 sizes and types of prescription ware of 1/2 to 16 oz. capacity are tabulated. The data include height, cross-section, cubic displacement, weight, capacity, ratio of wt. to capacity, vertical resistance, lateral resist., hydrostatic resistance, impact resistance, max. and min. thickness. In the strength tests, the round bottles were the best except that the panel shaped bottles had the highest resist. to lateral pressure. The sq. bottles were among the weakest in all tests except in the resistance to hydrostatic or internal bursting pressure in which the ovals were the poorest. Classed as to size the large bottles offered the best resist. to vertical pressures

and the small bottles to hydrostatic pressure. The lateral and impact resist. were very uniform for all sizes. All of the bottles tested were the product of one firm. J. B. PATCH (*C. A.*)

80. Flask calibrating and marking device. G. L. SPENCER. *J. Ind. Eng. Chem.*, **13**, 1058–9(1921); 1 cut.—The meniscus is accurately located by means of a pair of Pt electrodes, which extend into the flask to just above the surface of the distd. water. The latter, slightly acidified with H_2SO_4, is measured into the flask with a calibrated burette. The visible or audible evolution of gases at the surface indicates the point of contact. A graving tool whose point has previously been aligned with the bottom of the central electrode is revolved about an axis in line with the center of the flask, cutting a ring in the wax coating. A 1. flask with a neck 20 mm. in diam. can be graduated to 0.02 cc., the limit of accuracy of the burette. Results are given for a series of flasks so graduated. T. F. BUEHRER (*C. A.*)

81. Annealing of glassware—past, present, future. E. E. MILNER. *Nat. Glass Budget*, **37**, No. 28, 1–4(1921); 7 illus.—Historical and descriptive of the Dixon muffle leer. The muffle chamber is made up of 10 flue units, the first 4 in front being heated by the initial combustion of gases and the 6 rear flues utilizing the waste heat from the front flues. Leers up to 20 ft. in width are made to compare favorably in temp. distribution and fuel consumption with those of less than half that width. This is accomplished by narrowing the flue areas, thus increasing the velocity of gases and flame length. Provision is made for the introduction of elec. heating elements into these flues, this being the annealing method of the future. The following temps. are given as being typical in the case of machine-made fruit jars: Tank furnace 2200° F, mold 600°F, plunger 800°F, outer surface of jar as taken from mold 600°F, inner surface 700°F, interior of thick wall or bottom 1400°F. To relieve the strains set up by these varying temps. 1050°F is given as a suitable leer temp. No cooling rate is given. The Dixon Strain Finder is briefly discussed with illus. J. B. PATCH (*C. A.*)

82. Influence of silica on the annealing temperature of glass. S. ENGLISH, F. W. HODKIN, C. M. M. MUIRHEAD AND W. E. S. TURNER. *J. Soc. Glass Tech.*, **4**, 387–91(1920).—S series of simple Na silicate glasses ranging from $2Na_2O.4SiO_2$ to $2Na_2O.10SiO_2$ was examd. The upper annealing temp. was found to rise with increase of silica content, the rate of increase being most rapid between $2Na_2O.4SiO_2$ and $2Na_2O.7SiO_2$. J. S. C. I.

83. The effects of treating glass surfaces with certain lubricants. W. SHACKLETON. *Trans. Optical Soc.*, **20**, 155(1919); *J. Soc. Glass Tech.*, **3**, 253.—Tests were made with 3 lubricants, namely, Lasin, Everclear, and Nepheless, in order to det. which was the most effective in preventing "steaming" of the glass surface. The temp. at which the untreated glass was obscured was 19°, and this was reduced to −6°, −8°, and −10°, resp., after the lubricant had been applied. Nepheless, a prepn. made by S., consisted of glycerol with 20% of Na stearate added. H. G. (*C. A.*)

84. The composition of opaque glasses. J. B. KRAK. *Glass Industry*, **2**, 81–4(1920).—An account of the development of glasses for illuminating purposes. Such glass is like snow, colorless in itself but appearing white owing to the reflection and diffusion of light from innumerable small colorless particles. A number of methods for introducing these small particles into the glass have been and are in use. Alabaster and phosphate glasses are the oldest types and more recently the opacity has been produced with aid of fluorides. A list of opacifiers includes Mg silicates such as talcum and asbestos, phosphates such as bone ash, calcined guano and Na phosphate, fluorides such as Na and Ca fluorides, lepidolite, cryolite and fluorsilicates. With fluorides are used feldspar, china clay, Al_2I_3 or $Al(OH)_3$. Occasionally oxides of Sn, Ti or Zr are used. Auxiliaries are As and Sb, NaCl and $Na_2B_4O_7$, alkali and alkaline earth sulfates. Definite knowledge of the exact cause of the opacity is lacking. Various investigators have ascribed it to devitrification, imprisoned bubbles of gas or to a solid emulsion, and to colloidal particles in suspension as in a pigment. Several old batches and recent patents are included in the article. J. B. PATCH (*C. A.*)

85. Milk or alabaster glass. ASHER BLUM. *Glass Industry*, **2**, 84–5(1921). —A summary of 17 foreign and domestic patents for illuminating glassware. J. B. PATCH (*C. A.*)

86. Development of the glass industry. ALEXANDER SILVERMAN. *Glass Industry*, **2**, 92(1921).—Review. J. B. PATCH (*C. A.*)

87. Notes on glass cutting. ANON. *Diamant*, **42**, 658(1920); *Glass Industry*, **2**, 90(1921). J. B. PATCH (*C. A.*)

88. Ultraviolet and visible transmission of various colored glasses. K. S. GIBSON, E. P. T. TYNDALL, AND H. J. MCNICHOLAS. Bur. Standards, *Tech. Papers*, No. **148**, 27 pp.(1920); *Science Abstracts*, **24A**, 179; cf. *Jour. Am. Ceram. Soc.*, **3**, 338; *C. A.*, **14**, 457.—The paper summarizes investigations on 87 samples of glass, mostly colored. Spectral transmission curves extending from about 710 $\mu\mu$ throughout the visible and ultraviolet as far as any appreciable transmission is evident, are presented. The authors also give a chart connecting thickness of material and transmission. Among the uses to which such glasses may be put are ultraviolet signalling, railway signalling, improvement of visibility (both visual and photographic), eye-protection, selective filters. Photographic, photoelec., and visual methods are described. Photographic detns. were made with the Hilger sector-photometer and a quartz spectrograph. The visual data were obtained mainly with the König-Martens spectrophotometer. In an appendix some particulars of precautions necessary in obtaining data on the ultraviolet region are given and some spectrophotographs showing the effect of various solns. are included. H. G. (*C. A.*)

89. Colored glass batches. ANON. *Glasind.*, **31**, 217–8, 225–6, 233–4, 289, 297–8, 305–6(1920).—Ninety-five batches for colored glasses of many varieties are given. Cf. *C. A.*, **15**, 154. J. B. PATCH (*C. A.*)

90. Glass cutting. M. PINK. *Glasind.*, **31,** 313–4, 321–2, 329–30, 337–8, 345–6, 353–4, 367–73(1920).—Detailed instructions are given for cutting sheet glass of all kinds, chiefly with the diamond. Cf. Notes on Glass Cutting, *Glass Industry*, **2,** 90(1921); *Diamant*, **42,** 658(1920). J. B. PATCH (*C. A.*)

91. Gypsum as a substitute for limestone in the glass batch. R. *Glasind.*, **32,** 325–6(1921).—This substitution is not recommended.

J. B. PATCH (*C. A.*)

92. The smoke nuisance in glass melting. LUDWIG SPRINGER. *Glashütte*, **51,** 355–6, 371–2, 387–8, 403–4(1921).—A summary of the subject concluded by a personal experience of the author. A glass factory with a 45-m. stack was 150 m. from a forest. Neither SO_3- nor F-containing compds. were used in the batch. The fuel was coal and briquets in which a later test indicated a content of 2.0 and 1.0% respectively of volatile S. After 6 years of operation damage to the vegetation was evident in the path of the smoke from the stack. No change had been made in the fuel. Analyses of the ash of damaged and unaffected vegetation showed SO_3 to the extent of 0.19–0.20% in the latter while the former ranged from 0.30 to 0.51%.

J. B. PATCH (*C. A.*)

93. The firing of painted glass. F. HUTH. *Diamant*, **40,** 43, 57(1918); *J. Soc. Glass Tech.*, **4,** 140(1920).—Every mixture used for glass painting consisted essentially of a coloring substance and a fluxing agent, the latter effecting the combination of the former with the surface layer of the glass during the firing process. These mixts. were divided into two classes: (1) those in which coloring oxides were mixed with the flux immediately before use, and (2) the so-called "glass-painters' fluxes," in which the oxide was already united with the fluxing medium to form a glassy body, this being pulverized and mixed with oil for application to the glass. In order to prevent the furnace gases from coming into contact with the painted glass, the object to be fired was put into a muffle, and this inside the furnace. The muffle might be iron or fireclay, iron muffles being used for colors which were to be fired at a relatively low temp. The fireclay ensured a more uniform temp. throughout the interior of the muffle, and, therefore, was always used when great heat had to be applied. When the muffle was in the furnace, which might be heated by burning fuel inside it, the temp. was slowly increased, and the easily melted flux and the surface layer of glass combined and took up the coloring oxide. When this was accomplished the temp. must be very slowly lowered or the glass would crack. In practice, test-pieces were put into the muffle with the decorated object, the furnace was run for about three days, and then the test-piece examd. If the firing was complete, the fuel was removed from the furnace, which was closed up and allowed to cool for a further three days before being opened. The firing might have to be repeated two or three times, in which case the second coloring mixt. must contain more flux than the first. The repetition of the firing was a delicate process requiring careful handling. J. B. PATCH (*C. A.*)

94. Machine-drawing of glass tubing. J. F. SPRINGER. *Glass Industry*,

2, 110–12, 138–40(1921); illus.—A detailed description of the Edward Danner tube-drawing machine as operated by the Kimble Glass Co. of Vineland, N. J. J. B. PATCH (*C. A.*)

95. Novel method of handling molten glass. ANON. *Glass Industry,* **2,** 142(1921).—Molten glass can be drained from tanks through a 1″ hole on to a 40′ steel pan conveyor on which water is sprayed. This delivers the glass to another belt conveyor similarly equipped with water on which a canvas belt impregnated with rubber has been used successfully. Saving of time and labor is effected and the glass is very conveniently broken up. J. B. PATCH (*C. A.*)

96. The alkalimetric testing of glassware. F. MYLIUS. *Z. angew. Chem.,* **34,** Aufsatzteil, 281–4(1921).—A paper on the eosin reaction. Cf. *C. A.,* **2,** 450; **4,** 2557; **8,** 1000. J. B. PATCH (*C. A.*)

97. The pot and block room. P. K. EDUARD SCHNURPFEIL. *Glas-industrie,* **32,** 169–70, 181–4(1921).—The manuf. of pots, boots, rings and tank blocks is discussed in considerable detail. Dimensions and 8 recipes are given. The casting of pots is briefly mentioned. J. B. PATCH (*C. A.*)

98. Ten years of glass machinery manufacture. ANON. *Glassworker,* **40,** No. 32(1921); illus.—Historical account of the machinery of Wm. J. Miller of Swissvale, Pa. J. B. PATCH (*C. A.*)

99. Double refraction and crystalline structure of silica glass. LORD RAYLEIGH. *Proc. Roy. Soc.,* **98A,** 284–96(1920); cf. *C. A.,* **14,** 327, 604.—Silica glass when examd. with a special polariscope shows double refraction which is due not to stress but to a cryst. structure. This double refraction is of the order of magnitude of one-sixtieth that of cryst. quartz, and usually appears as a structure of doubly refracting grains about one-half mm. in size with no regular orientation. If the grained material is drawn out while hot, the grains elongate into fibers following the course of the material, and show "straight extinction" in the polariscope, their length being along one axis of the ellipsoid of optical elasticity. Optical silica disks show a spiral structure. By heating and cooling such a disk the structure may be made to disappear and reappear. DONALD E. SHARP (*C. A.*)

100. The devitrification of glass. HARRISON W. CRAVER. *Diamant,* **42,** 379; *Glass Ind.,* **1,** 40(1920).—A brief description of the process of devitrification. DONALD E. SHARP (*C. A.*)

101. Use of light soda ash in the production of flint bottle glass. C. A. COLE. *Glass Ind.,* **1,** 34–8(1920).—Lime batch containing light soda ash may be melted in glass tanks without a tendency toward formation of scum or seeds if high temp. and uniform methods of feeding are employed. A melting temp. of 2450°F (1340°C) is recommended. Analysis of batch and resultant glass show that little alkali is lost in melting. DONALD E. SHARP (*C. A.*)

102. The occurrence of crust or scum on continuous bottle tank furnaces. WILBUR F. BROWN. *Glass Ind.,* **1,** 29–30(1920).—Crust or scum in the melting chamber of glass tanks is usually high in SiO_2 and Na_2O but low in CaO. The causes of its formation are, a "cool" tank, or a batch of too high SiO_2

or CaO content. It can best be removed by using a proper batch and maintaining high temps., not by adding the common fluxing materials. Analysis of two-typical scums are given. D. E. SHARP (*C. A.*)

103. New Bergman gas and air valve described. HENRY W. HESS. *Glassworker*, **40**, No. 51, 11(1921); 2 illus.—"This valve is unique and practical in that the gas and air are reversed by the same operation and simultaneously, either by hand or automatically, being controlled by clock work and motor or by a thermostat placed in the checker work of the regenerators. This latter is a most essential and valuable feature, and greatly facilitates the regulation of even temps." The valve is circular in shape, brick-lined, water sealed, and is divided into 6 segments. The duration of reversal is 10 seconds during which time the valve passes through an angle of 120°.

J. B. PATCH (*C. A.*)

104. The industry of silica glass. G. FLUSIN. *Chimie & industrie*, **5**, 119–35 (1921); cf. *Jour. Am. Ceram. Soc.*, **4**, 868(1921).—The manuf. of the opaque and semi-translucent varieties of quartz glass is discussed. By means of the heat developed by passing a heavy current through a graphite rod embedded in pure quartz sand in a furnace, a cylinder of semi-fused quartz is formed around the resistor. The temp. is raised to such a degree that the gases formed by interaction between the quartz and the graphite core sep. the tube of quartz from the core. The tube is then withdrawn from the furnace, freed from adhering sand, and formed by drawing, blowing in molds, pressing, etc., the operations being fairly easily performed once the initial resistance due to surface cooling has been overcome. The outer surfaces of the objects are sand-blasted to remove incompletely fused grains of sand. Semi-translucent ware is produced by severe sand blasting followed by treatment with HF, by forming the quartz cylinder inside a graphite cylinder so that the entire charge of sand is used and both surfaces are subjected to radiant heat, or better by reheating to the softening point. This last method results in a marked decrease in size of the bubbles which are largely responsible for the opacity. J. S. LAIRD (*C. A.*)

105. The industry of silica glass. GEORGE FLUSIN. *Chimie & industrie*, **5**, 257–70(1921); cf. preceding abstract.—The manuf. of transparent quartz is described. The raw material for this variety must be of the highest purity both to avoid the discoloration caused by foreign oxides and to prevent the evolution of bubbles from chemical action. Zirconium and silicon carbides in one of their several forms are the most satisfactory refractories to date. A number of ingenious methods for avoiding or getting rid of the air bubbles occluded in the melt are briefly mentioned and patent references given. The quantity of air entrapped in the quartz mass is greatly increased by an expansion in vol. of about 1% at a temp. of 575° caused by a change in the cryst. structure to the β quartz allotrope. Devitrification is a source of trouble and is reduced by complete freedom from bubbles and other impurities. A bibliography of 117 items is attached to the article. J. B. PATCH (*C. A.*)

106. Modern development in manufacture of building glass. ROBERT G. SKERRETT. *Compressed Air Mag.*, **26**, 10135–42(1921); *Glass Ind.*, **2**,

194–7(1921).—A descriptive article of modern processes with numerous first class illustrations. J. B. PATCH (*C. A.*)

107. The steam gage tube situation. J. F. SPRINGER. *Glass Ind.*, **2,** 183–7(1921); 3 illus.—A very complete description of the hand process of drawing glass tubing, and of the impossibility of attaining precision in the diam. and wall dimensions of drawn tubing. J. B. PATCH (*C. A.*)

108. The etching of flashed glasses. ERNST BEUTEL. *Glas-industrie*, **30,** 109–10(1919). J. B. PATCH (*C. A.*)

109. "Keramo." F. Z. *Glas-ind.*, **30,** 197–8(1919).—Descriptive of the French Garchey process for the manuf. of decorative building stones from glass. J. B. PATCH (*C. A.*)

110. Is there need for improved glass in preserve jars? H. THIENE. *Glas-industrie*, **30,** 101–3(1919).—T. demonstrates the need for better glass to withstand temp. changes and soly. Jena glass is recommended. J. B. PATCH (*C. A.*)

111. Development of various types of glass. C. J. PEDDLE. *J. Soc. Glass Tech.*, **4,** 299–366(1920).—The prepn., stability, and optical properties of the following series of alkali, PbO, silica glasses were studied: 100 SiO_2, 40 Na_2O, xPbO; 100 SiO_2, 20 Na_2O, xPbO; 100 SiO_2, 40 K_2O, xPbO; 100 SiO_2, 20 K_2O, xPbO; 100 SiO_2, 20 Na_2O, 20 K_2O, xPbO; 100 SiO_2, 10Na_2O, 10 K_2O, xPbO, where x varied from 5 to 40 mols. All the glasses can be founded above 1350° and exhibit corrosive action on pot clay, increasing with increased alkali content. Glasses of the soda series tend to devitrify if contg. more than 65% SiO_2, and those of the mixed alkali series if the silica content exceeds 61%. The potash glasses show no signs of devitrification, but all film badly on prolonged heating at 900°. In all cases density and refractive index increase with increasing content of PbO, the rate of increase falling as the PbO content rises. Dispersion also increases with increase of PbO, but ν falls as η_D rises. Comparison of the above and also of further series contg. equal percentage amts. of potash and soda showed all the soda glasses to have higher densities than the corresponding potash glasses, the mixed alkali glasses having intermediate values. In the equimol. series the potash glasses have slightly higher refractive index and total dispersion, but in the series contg. equal. wts. of alkali the soda series has higher refractive index and dispersion. The refractive index and dispersion of the mixed alkali series are intermediate between those of the soda and the potash series. The soly. of the glasses in water decreases as the content of PbO or silica rises but increases rapidly with increase of alkali. Soly. tests prove the following glasses to be of first-class durability for optical requirements: Glasses of the mol. formulas, 20 Na_2O, 30 PbO, 100 SiO_2; 20 Na_2O, 40 PbO, 100 SiO_2; 10 Na_2O, 10 K_2O, 30 PbO, 100 SiO_2; 10 Na_2O, 10 K_2O, 40 PbO, 100 SiO_2; 20 K_2O, 40 PbO, 100 SiO_2; also glasses of the percentage compns., SiO_2 50, Na_2O 10, PbO 40; SiO_2 50, K_2O 10, PbO 40; SiO_2 40, Na_2O 10, PbO 50; SiO_2 40, K_2O 10, PbO 50; SiO_2 60, Na_2O 5, K_2O 5, PbO 30; SiO_2 50, Na_2O 5, K_2O 5, PbO 40; SiO_2 40, Na_2O 5, K_2O 5, PbO 50. The first two of the mol. series approximate in optical consts. to well known Schott glasses.

The Benrath formula 6 SiO_2, 1 R_2O, 1 PbO does not give a very stable type of alkali-PbO-silica glass, a more satisfactory one being 5 SiO_2, 1 R_2O, 1.5 PbO. J. S. C. I.

PATENTS

112. Cleansing and polishing paste for glass. J. M. Schwaner. U. S. 1,382,019, June 21. The mixt. is formed of whiting 58 lbs., powdered pumice 16 lbs., kerosene 19 lbs., Na_2CO_3 3 lbs., NaCl 3 lbs. and essential oils such as oils of citronella and geranium 2.5 oz. each. (*C. A.*)

113. Glass. E. C. Sullivan and W. C. Taylor. U. S. 1,369,988, Mar. 1. A glass adapted for *manuf. of elec. lamp bulbs* is formed of SiO_2, 62–79.4, Na_2O 16–23, MgO 1.6–15, CaO 0–8.8 and ZnO 0–3.1 parts. (*C. A.*)

114. Polish for glass or metals. H. Swanson. U. S. 1,381,250, June 14. A mixt. adapted for polishing Ag, Au or glass is formed of H_2O 8 oz., naphtha soap 1.75 oz., pptd. $CaCO_3$ 4 oz., $NaHCO_3$ 0.15 and cream of tartar 0.24 part. (*C. A.*)

115. Finishing glass. L. Showers. U. S. 1,373,532, Apr. 5. Smooth relatively opaque glass is polished with a polishing powder of about the same color as the glass with polishing devices maintained at such a temp. as to cause "burning" of the glass. A "soft" finish is thus formed on Carrara or other glass. (*C. A.*)

116. Apparatus for annealing glass or similar heat-treatments. D. E. Gray. U. S. 1,372,420, Mar. 22. (*C. A.*)

117. Mirrors. C. L. Tomlinson. Brit. 163,606, June 23, 1920. A glass mirror having a metallic reflecting surface embedded beneath its surface is made by depositing on a high-CaO glass Au, Ag, Pt, or Cu, and heating the glass for a short period in such a way that the surface only is caused to melt and absorb the deposit of metal. To form the metallic coating, dry chloride of Au, Ag, Pt, or Cu is mixed with oil of rosemary and made into a paste which is thinned with oil of lavender. The paste is applied to the polished surface of the glass, which is then heated sufficiently to evap. the oils. (*C. A.*)

118. Translucent antislipping tile. M. F. Beecher. U. S. 1,374,136, Apr. 5. A safety tread material is formed of a translucent substance such as glass into which are fused particles of hard, wear-resisting, antislipping material such as cryst. Al_2O_3 granules. (*C. A.*)

119. "Antislipping tile." H. K. Dodge. U. S. 1,377,960, May 10. Tread blocks are formed of particles of cryst. Al_2O_3 or material of similar hardness constituting the major portion of the block, and a binder of vitrified ceramic material. *C. A.*

Enamels

120. Anti-corrosive chemical engineering plant. Pumps for corrosive liquids. Anon. Eng. Dept. Guthrie & Co. Accrington, Eng. *Canad. Chem. Met.*, **5**, 341–44(1921); *Engineering*, **110**, 253–54(1920).—Describes centrifugal pumps and other equipment lined with a new cer. acid and heat

resisting coating, called ceratherm, which resembles porcelain. The cer. lining is cast in the desired form and cemented into place with an acid proof cement. It is a good heat conductor, resists sudden temp. changes, has high tensile strength and is claimed to be superior to all other cer. coatings hitherto employed. ED.

121. Enameled steel manufacture. CHESTER H. JONES. *Chem. Met. Eng.*, **25,** 883–86(1921).—The enamel is prepd. and applied by both the wet and the dry process. There are in general 4 different coatings used depending upon the service to which the ware is to be subjected. One is supplied for the malt industry only; the dairy, soft drink and pharmaceutical trade use another type; the third enamel is designed to resist all and any degree of acidity, and finally a special coat is used which is more decorative and while not compounded to combat acid has a reasonable resist. to it. Raw mats. ordinarily used are ground sand, quartz, feldspar, borax, cryolite, fluorspar, sodium and potassium compounds and clay. The raw mats. for making the frit are mixed by hand or in revolving drums. Five Abbé pebble mills and 4 special rotary smelters comprize the glaze room app. Ordinarily wet enamels are sprayed on the heavy pieces through the medium of a portable air spray nozzle guided by the hand of the operator. Chem. plant ware may be treated by the dry process, or dusting. In this case the metal surface is wetted and the dry powdered frit dusted on where it adheres to the water film. The equipment for burning enamel to the steel consists of a total of 7 furnaces, 4 of which are the open type, 2 complete muffle type and 1 vertical furnace of special design used for firing small articles that would involve waste of heat if treated in the large furnaces. This furnace consumes oil for fuel, the remainder burning coke. Muffle furnaces are employed largely for burning light wares, especially the light enamels, while the heavier steel pieces are fired in the open type. The temps. range from 1,500° to 2,000°F. The temp. in any one firing depends on the enamel. Hoskins' pyrometers record the temps. of each furnace. Adjacent to each battery of furnaces is one enamel application room. The coated ring or tank is picked up by a traveling charging crane and placed in the open-type furnaces, where it is revolved on a turntable while burning. The muffle furnaces are served by power tongs, which pick the pieces from tables moving on industrial tracks along the front of the battery and place them within the burning chamber in each case. The special upright circular kiln is charged through split doors in the top and is equipped with two firing holes located in the side near the bottom. The waste gases from all furnaces is conducted through waste heat boilers in the power plant. H. F. S.

122. Enamel-lined apparatus. CHESTER H. JONES. *Chem. Met. Eng.*, **25,** 927–932(1921). General description of the plant of the Elyria Enameled Products Co., Elyria, O. (See preceding abstract).—The company makes 3 general grades of enamel (compns. not given) some of the uses of which are outlined in the following paragraphs. Enamel No. 11, which is applied to cast-iron ware, has been found to resist the action of inorganic acids such as

hydrochloric, nitric, phosphoric, sulphuric, hydrobromic, hydriodic, aqua regia at any strengths and any mixts. of these. It is acted upon by hydrofluoric acid of any strength. It resists action of stannic chloride in hydrochloric acid, zinc chloride up to 300°C, gaseous hydrochloric acid, aluminum chloride, bromine, chlorine, iodine (moist or dry), tungstic oxide precipitation by hydrochloric and nitric, sulphur dioxide, thorium nitrate in nitric acid, and manganese dioxide with hydrochloric acid. It may be used for all org. acids, acid chlorides and org. compds., being particularly resistant to acetic vapors. It is successful in vessels for heating magnesium hydroxide under pressure, for evapg. lime salts of sulphocarbolates or boiling sodium carbonate, for ammonia and sodium or potassium salts of inorg. comps., but is decomposed by caustic alkalies and is acted upon slightly by hot milk of lime. Sodium cyanide and similar salts are too alkaline and react with it. It is more resistant to alkalis than most enamels. Enamel No. 20, which is applied to steel, has been used successfully for all strengths of org. acids (hot or cold), ammonium sulphate, acetic anhydride, acetic acids of all strengths (but not vapors), brine, moist chlorine, hydrochloric acid in alcohol, hydriodic acid, lactic acid of all strengths (hot or cold), hot phenol, tin chloride plus 1% hydrochloric acid, zinc chloride soln., hot sulphur chloride, inorg. acids below 0.5% strength cold, sulphuric acid above 50% strength and mixed acids high in sulphuric acid, hot or cold. If the reagent is one which attacks iron severely, the enamel coat must be perfect, limiting the size to 600 gal. If there is no severe action on iron, any size up to 3,000 gal. can be had. The limiting size must be decided for each condition by itself. It is also used for hot carbonate, cold sodium hydroxide 10% and hot ammonia. Enamel No. 21, which is also applied to steel, is used for all conditions of milk, such as milk heating, holding, mixing, etc.; for oils, fats, alcoholic solutions of shellac, ammonia, aniline hydrochloride, acetic acid, storage cold; ammonium nitrate, bleach liquor, dry chlorine, dry hydrochloric acid gas, cold beverage sirups involving citric acid, grape juice, hydrogen peroxide, tincture of iodine, making invert sugar, hot oil of peppermint, cold phenol, salicylic acid and hot acetic anhydride, dry sulphur dioxide, tannic acid, hot bromine, distilled water, and hot fuming sulphuric. The last has been handled more successfully by No. 21 than by other enamels. For perfect coats the sizes are limited to 1,000 gal. Otherwise any size up to 7,000 gal. can be obtained. Here, as with No. 20, the limiting size can be detd. only after making a study of the case in hand. Cast iron units may be used with 75-lb. steam pressure in the jacket and up to 100 lb. inside the still. It has a coeff. of heat transmission about $^1/_4$ that of copper. With steam, temp. up to 160°C in the jacket can be obtained. Up to 225°C an oil jacket can be used. Superheated steam at 315°C has been used on the small units. The enameled units have also been heated by a direct, well-spread flame up to temperatures of 300°C, but such service is rather severe, limiting the life of the enamel. Steel units are usually heated by means of a steam jacket, the 500-gal. sizes permitting 30-lb. pressure, the large ones, such as 3,000 gal., being limited to 10-lb. pressure. The pressure within the tank may be $1^1/_2$ times as great as that in

the jacket. The coeff. of heat transmission is about $^1/_3$ that of copper, using straw as a heating medium. Using oil in the jacket (which has been done up to 250°C), the coeff. drops to $^1/_5$ that of copper. H. F. S.

123. Enameled Products Research Laboratory. EMERSON P. POSTE. *Chem. Met. Eng.*, **25,** 974(1921).—A detailed description of the research laboratory of the Elyria Enameled Products Co., Elyria, O. Facilities are provided for small-scale factory opern. expts. in cer. engineering, with special reference to enameling of metals, chem. engineering, and metallurgical engineering. An analytical dept. serves the 3 other depts. H. F. S.

124. The new Meurer enamel spraying process. ANON. *Glashütte,* **51,** 131–2, 147–8(1921); cf. *Jour. Am. Ceram. Soc.*, **4,** 787; *ibid.*, **4,** 1015; 1 fig.—A modification of the Schoop spraying gun or nozzle. J. B. PATCH (*C. A.*)

Heavy Clay Products

125. New method for drying clay. ANON. *Chem Met. Eng.*, **25,** 753 (1921).—Pottery plants at Devon and Cornwall, are now using a new method for drying clays, in which two metal drums are employed, one enclosed in the other. The inner drum is driven by mech. means, and while revolving, steam enters in at a few degrees above the temp. of boiling water. The clay is passed into the outer drum and comes into contact with the inner drum as it revolves, filled with steam. The water in the clay is evapd. and the clay dries quickly, the process being one measured in mins. H. F. S.

126. Some causes of the so-called disintegration of terra cotta brick, and allied ceramic materials and suggested remedies. H. A. PLUSCH. *N. J. Ceramist,* **1,** 65(1921).—Discussed under the following headings (1) high porosity of the body; (2) high silica content of the body; (3) the effect of soluble salts; (4) poor workmanship; (5) lack of mortar in joints and poor mortar; (6) uneven thickness of ware; (7) effect of the sun and frost; (8) settlement of buildings. C. W. PARMELEE

127. A note on body cracking of terra cotta. E. C. HILL. *New Jersey Ceramist,* **1,** 70(1921).—The author concludes that fire cracking may not be due to variations in the firing temp.; that it seems possible to crack a body of almost any compn. by too rapid cooling; that a considerable range of compn. is possible in bodies without producing fire cracking, if the pieces are cooled slowly; dense bodies are more sensitive, therefore the use of grog of suitable size and quantity is advisable; the greater the amount of sandy clays used the greater the contraction between 650° and 850°; the most effective prevention is slow cooling at the lower temps. particularly from 650° to 500°C. C. W. PARMELEE

128. Building blocks made from boiler scale. KOCH. *Tonind. Ztg.*, **44,** 360; **47,** 387, 388(1921).—A factory has been started at Eberfeld to manuf. cheap building blocks for workmen's dwellings from a slime obtained by digesting the slag produced by the municipal gas plant. They claim to have a capacity of $2^1/_2$ million blocks per annum, and to produce building blocks at low fuel cost. WM. M. CLARK

129. Report of Committee C-3 on brick. H. T. Shelley and Warren E. Emley. *Proc. A. S. T. M.*, **21**, 284(1921).—*Cement brick* has been included in the committee's activities. The committee recommendations on specifications for sewer brick follow. Ed.

130. Tentative specifications for clay sewer brick. Anon. *Proc. A. S. T. M.*, **21**, 527–32(1921).—These specifications cover four classes of clay bricks intended to be used in drainage structures for the conveyance of sewage, industrial waste and storm water, as follows, the purposes for which they are intended to be especially suitable being indicated:

Class A Vitrified Brick, for the interior of structures where resist. to the abrasive action of velocities up to 18 ft. per sec. is required.

Class B Vitrified Brick, for the interior of structures where resist. to the abrasive action of velocities up to 12 ft. per sec. is required.

Hard Brick, for structures requiring imperviousness to internal and external pressures and resist. to the abrasive action of velocities up to 8 ft. per sec.

Medium Brick, for storm water conduits, where a high degree of imperviousness is not required and where abrasive action is due to low velocities only.

For definitions of the above classes, see Table I.

Table I.—Physical Test Requirements for Different Classes of Brick

	Absorption Limits, Per cent		Compressive Str. (on Edge), Lb. per Sq. In.		Modulus of Rupture, Lb. per Sq. In.	
Glass	Mean of 5 tests	Individual maximum	Mean of 5 tests	Individual minimum	Mean of 5 tests	Individual minimum
Class A Vitrified	3 or less		5000 or over		1200 or over	
Class B Vitrified	5 or less	6.0	5000 or over	4000	1200 or over	800
Hard	5 to 10	12.0	3500 or over	2500	600 or over	400
Medium	10 to 15	17.0	2000 or over	1500	450 or over	300

Bases for purchase and acceptance are established. Nature of *raw materials*, *standard sizes*, and *methods of sampling* are specified. Provision is made for the following tests, details of which are described: *Chem. examn.; absorption, compressions* and *transverse tests; visual inspection.* Ed.

131. Report of Committe C-4 on clay and sewer pipe. R. Hering, G. T. Hammond and A. J. Provost, Jr. *Proc. A. S. T. M.*, **21**, 285(1921).—No revisions were made in specifications. Sub-committees are now considering the following subjects: Absorption and hydrostatic pressure test requirements; chem. requirements; dimensions and their permissible variations; methods of testing; nomenclature and definitions. E. N. Bunting

132. Report of Committee C-6 on drain tile. Anson Marston and J. T. Stewart. *Proc. A. S. T. M.*, **21**, 286–88(1921).—The tentative specif. for drain tile on p. 817 of the 1920 Proceedings have been recommended for adop-

tion as standard. The vital importance of thorough underdrainage in connection with all types of roads is just beginning to be realized and the hundreds of thousands of miles of tile required will be subjected to the standard tests. The main research investigation being carried on at present is the best development of chem. tests and chem. test requirements for drain tile to det. their resist. to the action of soil acids and alkalies. This research is being carried on at 5 different laboratories and will require at least 2 years to develop standard specifications. E. N. BUNTING

133. Report of Committee C-10 on hollow building tile. WALTER A. HULL AND CHAS. C. CROCKATT. *Proc. A. S. T. M.*, **21**, 324–25(1921).—As it has been found that the absorption test does not satisfactorily differentiate between acceptable and unacceptable tiles, the test has been omitted from the latest tentative specif. It is also recommended that the test specimens be taken from unbroken tile, as it has been found that while unbroken specimens may resist freezing satisfactorily, fragments from similar pieces do not. The Hollow Building Tile Association, in coöperation with the Bureau of Standards is carrying out an investigation of the physical properties of hollow building tile with special reference to their fire resist. and data already obtained has proved of great assistance to the Committee in the prepn. of the tentative specifications. E. N. BUNTING

134. Tentative specifications for clay hollow building tile. ANON. *Proc. A. S. T. M.*, **21**, 547–52(1921).—The specif. cover (1) Materials and manuf. (2) Physical props. and tests, including (*a*) compression test, freezing test, fire test; (*b*) selection of samples for test; (*c*) strength tests; (*d*) freezing test; (*e*) tolerances. (3) Standard sizes and dimensions. (4) Workmanship and finish. (5) Marking. (6) Inspection and rejection. E. N. BUNTING

135. Tentative definitions of terms relating to hollow tile. ANON. *Proc. A. S. T. M.*, **21**, 602–603(1921).—The definitions cover the following: I. Kinds of tile, as (1) hollow clay, (2) terra cotta, (3) hollow-building, (4) load-bearing: (*a*) floor, (*b*) foundation, (*c*) side construction, (*d*) end construction, (*f*) book, (*g*) vitrified, (*h*) salt-glazed; (5) hollow fire proofing, as (*a*) partition, (*b*) furring, (*c*) porous. II. Raw materials: (6) shale, (7) fire clay, (8) surface clay. III. Designation of dimensions, as (9) thickness, (10) width, (11) length. IV. Parts, openings, and surface features: (12) shells, (13) webs, (14) cells, (15) scoring. E. N. BUNTING

PATENT

136. Bricks. R. MILNER and T. ROBINSON. Brit. 163,569, April 13, 1920. Blast-furnace slag is ground and mixed with not more than 20% of clay and a sufficient quantity of ground C fuel to form a self-burning mixt., which is molded into the required shapes for bricks, etc., dried and then fired in kilns. A suitable mixt. is 70–85% slag, 5–20% clay, and 5–15% fuel.

Cement, Lime and Plaster

137. Bentonite. R. B. LADOO. Bureau of Mines Report. No. 2289, 5 pp. October, 1921. *Jour. Ind. Eng. Chem.*, **14**, 89(1922).—This rept. devotes

particular attention to the commercial utilization of bentonite in the manuf. of paper, soap, *gypsum* and *lime plasters*, adhesive paste, and as a water softener and dewatering agent for crude petroleum. ED.

138. "Mazout" (burning oil) as fuel for lime kilns. A. STOLL. *Rev. Mat. Constr. Trav. Pub.*, **146**, 216–17(1921).—Sketches of kiln and burner to take place of those given with article on the same subject in **142**, 129–30 (1921). Cf. *Jour. Amer. Ceram. Soc.*, **4**, 873.

139. Artificial cement by the "two fire" practice. C. DIDIER. *Rev. Mat. Constr. Trav. Pub.*, **146**, 201–203(1921).—Limestone is first burned, then slaked, giving an impalpable powder. The powder can be screened, then mixed with the requisite amts. of clay and water, pressed into brick, and then burned either in a vertical or a rotary kiln. D. favors the vertical kiln for the reason that higher temps. can be more readily and less expensively obtained than in the rotary kiln. LOUIS NAVIAS

140. Acid proof cements. DR. KLEINLOGEL. *Tonind. Ztg.*, **55**, 460(1921).—Described expts. with cements resisting the attack of acids and water. WM. M. CLARK

141. The English cement standards. ANON. *Tonind. Ztg.*, **51**, 423, 424(1921).—The specifications surrounding the pull test and Vicat needle indentation test on specimens of cement are described. WM. M. CLARK

142. Superior cements. H. KÜHL. *Tonind. Ztg.*, **49**, 406, 407(1921).—Consideration of improved quality and limitations governing the factors entering into same. WM. M. CLARK

143. Testing of plastic calcined magnesite for use in oxychloride cements. MAX Y. SEATON. *Proc. A. S. T. M.*, **21**, 1039–49(1921).—A short discussion of the general properties of oxychloride cements is followed by the physical tests for such cements including strength tests, setting time, vol. change, and permanence. The factors influencing the properties of these cements are given, *viz.*, the consistency of the mortar, the strength of the $MgCl_2$ soln., the character of the aggregate, storage conditions, and the quality of the calcined magnesite used. There is a wide discrepancy between the chem. anal. and physical tests, due to the fact that the time-temp. history of the calcining procedure is of vital influence on the reaction between MgO and $MgCl_2$. Suggested specif. are given. E. N. BUNTING

144. Report of Committee C-9 on concrete aggregates. S. E. THOMPSON AND A. T. GOLDBECK. *Proc. A. S. T. M.*, **21**, 317–21(1921).—Several tentative standards have been presented for adoption. Grading and impurities have become more and more prime factors in dealing with materials for concrete. An outline of various tests and researches is given, the lines of research in which the committee are engaged being (1) Laws of mech. mixts. of cement and aggregate; (2) Further researches on impurities; (3) Investigations of coarse aggregates to det. their relative value for concrete and mixts.; (4) The best type of specimen for mortar test; (5) The distribution of aggregate materials throughout the country; (6) Specif. for concrete; (7) Testing of field concrete after it is in place. E. N. BUNTING

145. Tentative specifications for concrete aggregates. ANON. *Proc. A. S. T. M.*, **21**, 544–46(1921).—Under fine aggregate are the definition; grading; strength in concrete; mortar strength; colorimeter test; concrete tests. Under coarse aggregate are the definition and the grading.
E. N. BUNTING

146. Report of Committee C-7 on lime. H. C. BERRY AND L. H. HART. *Proc. A. S. T. M.*, **21**, 289–93(1921).—A large amt. of research work has been done by the members of the committee on the prepn. of specif. for lime. It is requested that the present standard specif. for quicklime and hydrated lime be withdrawn and the revised specif. be adopted as tentative. A series of panel tests of lime plaster is under way and extensive research into the quality of sand suitable for use with lime as a plaster is being conducted. Revised methods of anal. have been recommended for tentative acceptance. Methods of detg. "available lime" and the d. of bulk lime have been developed and will be submitted at a later date. The plasticimeter designed by the Bureau of Standards has been adopted as a plasticity measuring instrument. It has been detd. that the plasticity of finishing hydrate is dependent upon its colloidal content. A very important advance has been made in the development of a set of directions for slaking lime and for the prepn. of mortar from putty. E. N. BUNTING

147. Coöperative tests on the effect of hydrated lime on concrete mixtures. ANON *Proc. A. S. T. M.*, **21**, 294–301(1921).—Test results from 5 laboratories, principally on wear and compression are given on the effect of small additions of hydrated lime to concrete mixts. used in roadwork. From the large no. of tests made it appears that the addition up to 15% of lime has little effect upon the compression strengths, but variable values are obtained, dependent upon the sand and the different kinds of fine aggregate used, ranging from 90% to 110% of the strength without the addition of lime. Addition of lime increases the wear from 5 to 50%. In the discussion Mr. D. A. Abrams gives a large number of tests which confirm in general the above results. E. N. BUNTING

148. Tentative specifications for quicklime for standard purposes. ANON. *Proc. A. S. T. M.*, **21**, 533–36(1921).—The specif. cover the following: definition; general quality; classes and sizes; basis of purchase; sampling; chem. properties and tests; physical properties and tests; inspection and rejection; method of test for percentage of waste. An appendix gives directions for slaking and for prepn. of putty for use. E. N. BUNTING

149. Tentative specifications for hydrated lime for structural purposes. ANON. *Proc. A. S. T. M.*, **21**, 537–43(1921).—After giving the defn. for hydrated lime, specif. for mason's hydrate are given under uses; chem. properties and tests; physical properties and tests, such as fineness, constancy of vol. and tensile strength; packing and marking; inspection and rejection; methods of test for fineness, constancy of vol. and tensile strength. Under finishing hydrate are uses; properties and tests; marking; general require-

ments; plasticity, which is detd. with the Emley plasticimeter, a diagram of which is given. E. N. BUNTING

150. Tentative methods of chemical analysis of limestone, lime and hydrated lime. ANON. *Proc. A. S. T. M.*, **21,** 565–76(1921).—After giving directions for the treatment of the sample, methods are given for the detn. of SiO_2, Fe_2O_3, Al_2O_3, CaO, SrO_2, MgO, ignition loss, mech. moisture, CO_2, SO_3, total S, P, MnO, and FeO. Over a page of notes are included. E. N. BUNTING

151. Report of Committee C-11 on gypsum. WARREN E. EMLEY AND V. G. MARANI. *Proc. A. S. T. M.*, **21,** 326–28(1921).—Revisions made in the tentative specif. are listed. (Specif. are abstracted below.) E. N. BUNTING

152. Tentative specifications for gypsum. ANON. *Proc. A. S. T. M.* **21,** 553–55(1921).—The specif. cover (1) materials and standards, (2) sampling, (3) packing and marking, (4) inspection and rejection. E. N. BUNTING

153. Tentative specifications for calcined gypsum. ANON. *Proc. A. S. T. M.*, **21,** 556–58(1921).—The specif. include the same items as Abs. 152. E. N. BUNTING

154. Tentative specifications for gypsum plastering sand. ANON. *Proc. A. S. T. M.*, **21,** 559(1921).—The sand should be free from salt and from alkaline, organic and other deleterious substances and should be of the proper fineness. E. N. BUNTING

155. Tentative methods of testing gypsum and gypsum products. ANON. *Proc. A. S. T. M.*, **21,** 590–99(1921).—The methods cover, (1) detn. of free water in gypsum, (2) detn. of fineness, (3) chem. anal. of gypsum for combined H_2O, CO_2, SiO_2, and insol. material, Fe_2O_3 and Al_2O_3, CaO, MgO, SO_3 and NaCl. Notes on methods, (4) precautions for physical tests, (5) testing consistency of calcined gypsum, using a Southard viscosimeter, diagram of which is given, (6) water-carrying capacity, (7) detn. of dry bulk and (8) of wet bulk, (9) detn. of time of setting, (10) of tensile strength, (11) of compressive strength, and (12) of sand-carrying capacity of calcined gypsum. E. N. BUNTING

156. Tentative definitions of terms relating to the gypsum industry. ANON. *Proc. A. S. T. M.*, **21,** 600–601(1921).—The following terms are defined: acceleration, aggregate, binder, cement, consistency, Keene's cement, mortar, plaster, plasticity, retarder, stucco, wood fiber. E. N. BUNTING

157. The effect of some physical conditions on calcium sulfate cements. C. L. HADDON. *J. Soc. Chem. Ind.*, **40,** 122–3T(1921).—Brief description is given of setting of anhydrous $CaSO_4$ cement and discussion of expansion and contraction in setting. Measurements of expansion were made by Le-Chatelier's app. on a number of samples. Results of expts. show (1) the expansion was least when accelerating solns. were used, and greatest when retarders were used; (2) wet set plaster using 5% soln. of sulfate as accelerator, although reaching its max. strength within 24 hrs., yet continued to expand during crystn., (3) wetness has great effect on tensile strength and the degree of wetness affects expansion, (4) the expansion under normal conditions is

very small—about 0.1%—and ceases within 7 days. The effect of expansion on the tensile strength and the weakness of flooring plaster by wetness and also the effect of mineral oils are discussed briefly. It is suggested that the conditions for briquette breaking should be precisely as is done with Port. cement—leave the briquettes in the mold for 24 hrs., take them out and place them in H_2O and then break the wet briquettes after a week. C. N. Wiley (*C. A.*)

158. Crystallization processes and transformations in the hardening of Portland cement. F. Schott. *Tonind. Ztg.*, **62**, 537(1921).—Description of chem. and crystn. changes observed. Wm. M. Clark

159. The dependence of the lime industry upon nature and science. A. D. Little. *Chem. Met. Eng.*, **25**, 149–52(1921).—An address. The markets for lime developed as a result of scientific investigation. The technical problems of the industry are discussed. Phys. properties are often more important than chem. properties. Progress already attained in kiln design and the mechanical equipment for the transportation of materials must be followed by accurate chem. control of operations. W. H. Boynton (*C. A.*)

160. Gypsum. Frank A. Wilder. *Mineral Ind.*, **29**, 340–8(1920).—1920 was a record year in all branches of the gypsum industry. Agricultural gypsum increased 270%. A. Butts (*C. A.*)

161. Lime in 1919. G. F. Loughlin and A. T. Coons. U. S. Geol. Survey, *Mineral Resources of U. S., 1919*, Part II, 405–18(preprint No. 31, published Oct. 6, 1921). E. H. (*C. A.*)

162. Cement. Robert W. Lesley. *Mineral Ind.*, **29**, 74–87(1920).—A review of the cement industry in the U. S. and foreign countries, giving statistics and notes on technology. A. Butts (*C. A.*)

163. Cement in 1919. Ernest F. Burchard. U. S. Geol. Survey, *Mineral Resources of U. S., 1919*, Part II, 387–404(preprint No. 30, published Sept. 21, 1921). E. H. (*C. A.*)

164. Interpreting the chemical analysis of Portland cement. J. W. Witt. *Eng. News-Record*, **87**, 650–2(1921).—The limitations of chem. analysis in testing Portland cement are discussed. The relative amts. of the several components can not be detd. directly, and indirect analysis involves so many sources of errors that the results are not dependable. Since the relation between the compn. and physical behavior of cement is not fully understood, physical tests are indispensable. J. C. W. (*C. A.*)

165. The destruction of cement and of concrete conduits and masonry for sewage canals, reservoirs and similar works, and suitable means of prevention. A. Splittgerber. Mannheim. *Z. Wasserversorgung Abwasserkunde*, **7**, 46–8, 51–5, 63–5(1920).—Both cements and concretes are easily destroyed by various agents. These agents are classed according as they occur in (1) the ground underlying the works; (2) the liquid conducted or held; (3) the surrounding air and (4) the materials used as ingredients in the cement or concrete. In (1) and (2) are acids and acid salts, chiefly those giving an acid reaction with Congo red, methyl orange or rosolic acid, but occasionally those neutral to these indicators; any S compd., especially H_2S, sulfates,

sulfites, thiosulfates and sulfides; nitrates; H_2O contg. CO_2; Mg compds.; Na and K salts and saponifiable fats and oils. In (3) are chiefly H_2S and CO_2. In (4) are most frequently $CaSO_4$ and Mg compds. Together with these agents are incidental effects such as elec. energy and mechanical vibration. According to Endell the most injurious effects are from H_2O contg. sulfates of all kinds and humus waters from marshy soil. Upon the class and character of the injurious agent depend the possibility and method of protection. Cements and concretes resistant to the agents are classed as those (1) mixed without a flux; (2) with a preventive chem. compd. incorporated in the mixt.; (3) with an insol. org. compd. incorporated in the cement or concrete to prevent porosity and (4) with a superficial impregnation of a resistant substance to prevent microporosity. To (1) belong cements and concretes without a flux which reacts with the external injurious compd. Trass and puzzuolana are the commonest substances added to increase resistance in (2). (3) includes certain soaps, fats and oils incorporated in the mixt. (4) includes Mg, Si and Al fluorides, tars and asphalts. Compds. which are seldom concerned but which attack cements are $(NH_4)_2C_2O_4$, $C_3H_5(OH)_3$, sugar, NH_3 and Pb and Zn compds. Besides the agents mentioned, the mollusks, *Teredo navalis*, *Lithodomus* (*Lithophagus*) and *Pholas dactylus* destroy cements. The articles are replete with references to previous investigators but without the sources. S. asserts however that complete references in the literature will be furnished on application. C. C. Davis (*C. A.*)

PATENTS

166. Cements. E. Wallin. Brit. 157,971, Jan. 10, 1921. A cement, particularly applicable for jointless floor coverings, comprizes MgO and Mg nitrate or salts, such as $Ca(NO_3)_2$ and $MgSO_4$, which will interact to produce Mg nitrate. The materials may be mixed in the dry state and moistened when required for use. (*C. A.*)

167. Cement. H. D. Baylor. Brit. 158,390, Nov. 8, 1919. See U. S. 1,323,952. (*C. A.*)

168. Burning lime. J. C. Schaffer. U. S. 1,377,367, May 10. A steam supply is provided by which steam may be introduced beneath the grate of the furnace which heats a lime-burning kiln, in order to humidify the heating action of the furnace and temper the combustion zone extending from the furnace into the kiln.

169. Producing lime. W. Crow and J. C. Schaffer. U. S. 1,377,401, May 10. Limestone is mixed with hydrated lime and the mixt. is gradually heated for effecting porous nodulization. The product thus formed is suitable for making mortar or wall coatings.

170. Coating cement with celluloid. F. C. Ruppel. U. S. 1,379,837, May 31. A sheet of celluloid is attached to the surface of concrete tiles or other concrete bodies by an intermediate layer of fibrous fabric, *e. g.*, cheese cloth.

171. Oxychloride cement. G. M. Formby. U. S. 1,379,680, May 31. A mixt.of $Ca(OH)_2$ and $Mg(OH)_2$ is treated with HCl and the product thus

obtained is added to Portland or other cements in order to harden and strengthen them.

172. Waterproofing cement. L. M. KREGELIUS. U. S. 1,382,986, June 28. A waterproofing mixt. for use with cement is formed of slaked lime mixed with paraffin or similar H_2O-repellant wax-like material.

173. Fireproof and insulating cement mixture. E. R. STOWELL. U. S. 1,382,329, June 21. A fireproof and insulating material adapted for use in building construction is formed of cement, Na silicate, powdered pumice and wood particles.

174. Hydrating lime. H. W. CHARLTON. U. S. 1,381,106, June 14. A hydrate of lime contg. less than the usual amt. of H_2O of hydration is prepd. by digesting slaked lime with an excess of H_2O under a pressure of 225 to 270 lbs. per sq. in. and at a corresponding temp.

175. Potassium compounds from cement-kiln gases. H. V. WELCH. U. S. 1,382,037, June 21. Cement-kiln gases or the like are treated with H_2O in such a manner as to obtain a satd. soln., and the sludge thus obtained is then heated to render additional K compds. sol. and the soln. is sepd. from the residue for recovery or utilization of its values.

BOOK REVIEWS

American society for testing materials. Proceedings of the Twenty-Fourth Annual Meeting. Pp. 1197 + 285 figures + 6 plates. Published by the Society., 1315 Spruce St., Phila., Pa. Price: $10, paper.

Volume 21 of the Proceedings surpasses its predecessors in magnitude. The subject matter is classified under the headings (1) Committee Reports, (2) New and Revised Tentative Standards and (3) Technical Papers. Material of ceramic interest is found under each heading. Full abstracts of all such material will be found in the preceding pages of this number of *Ceramic Abstracts*. ED.

The manufacture of optical glass and of optical systems. Ordnance Department Document No. 2307. LIEUT.-COL. F. E. WRIGHT. Pp. v + 309 and 94 figs. Government Printing Office, Washington, D. C., 1921.

According to the author, Lieut.-Col. F. E. Wright, Ordnance Reserve Corps, "The present report seeks to outline, in a general way, some of the factors which we encountered in the manufacture of optical glass and of lenses and prisms for fire control and observation instruments for the Army and Navy. The lessons to be learned from our recent experiences along these lines are so obvious that comment is unnecessary. Such lessons are soon forgotten by the country at large. It is, however, essential, that a written record be made of the war-time development of certain of the manufacturing problems as they confronted us and were solved. The record may serve a useful purpose, and be of value in case of a future emergency."

It is indeed gratifying that the record of a notable accomplishment, even though it has been well covered in journal articles, has been incorporated into

a single treatise and has been used in a permanent form. It is not only a treatise on the technology of the manufacture of optical glass and of optical systems but it is also a very readable story of the development in this country of the optical glass industry which was necessary to meet the war-time needs of the military forces and which, in a period of one and one-half years produced over 600,000 pounds of usable optical glass.

In presenting the several subjects, graphs, drawings and photographs are freely employed and particularly in the discussions of technology, numerous references are made to the literature. Accordingly this report will find a large use as a reference work and it is of particular interest to the entire glass industry by reason of the principles set forth under the discussion of the annealing of glass. The chapter titles are as follows:

I. Introduction.
II. The characteristics of optical glass.
III. The manufacture of optical glass.
IV. The inspection of optical glass.
V. The manufacture of lenses and prisms.
VI. The inspection of finished optical parts and systems.
VII. The optical instrument situation during the war.

This volume is bound in full canvas, lettered in gold and trimmed in red and black. The proof reading has been well done, the topography is excellent and a comprehensive index is included. E. W. T.

Vol. 1 APRIL, 1922 No. 4

Ceramic Abstracts

Ross C. Purdy, Editor
Lord Hall, O. S. U., Columbus, Ohio

Abstractors: E. N. Bunting, W. M. Clark, L. H. Cole, G. S. Fulcher, S. L. Galpin, Seiji Kondo, A. T. Malm, R. J. Montgomery, Louis Navias, C. W. Parmelee, C. M. Saeger, Jr., H. G. Schurecht, R. B. Sosman, H. F. Staley, E. W. Tillotson.

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General and Miscellaneous

1. Some general remarks for factory organization. ANON. *Sprech.*, **53,** 493(1920).

2. Air cracks in grog products. FISCHER. *Tonind. Ztg.*, **44,** 1270(1920).—These cracks are due to air trapped in the body.

3. An oil purifier. ANON. *Tonind. Ztg.*, **44,** 662(1920).—The impurities including water are removed from oil by centrifugal force.

4. "Osmo" clay (Westerwald). ANON. *Tonind. Ztg.*, **44,** 630(1920).—The compn. of the clay and the method of purifying it are described. It is remarkable in having a high alkali and low feldspar content.

5. The condition and prospects of the British ceramic industry. J. A. AUDLEY. *J. Soc. Chem. Ind.*, **40,** 21–22(1921). E. H. (*C. A.*)

6. The Cottrell process of electrical precipitation. H. A. WINNE. *Gen. Elec. Rev.*, **24,** 910–21(1921); 13 illus.—History, theory and full detailed account of most modern app. and its operation. C. G. F. (*C. A.*)

7. Problems in heat economy (in Germany). RUMMEL. *Z. Ver. Zuckerind.*, **71,** 539–49(1921).—The principal present-day problems are: (1) The use of powdered coal (profitable only where a good grade with low ash can be obtained cheaply, and where special large furnaces are available); (2) the use of powdered semi-coke; (3) the use of coal gas; and (4) the use of steam storage tanks; these are now made with a capacity of up to 345 m.^{3} of water, into which the steam is blown at high pressure and released again as needed. By the use of these tanks a saving of 15% of coal has been effected.
F. W. ZERBAN (*C. A.*)

8. Liquid, colloidal and powdered fuels. ORMANDY. *Colliery Guardian*, **122,** 311–2(1921).—The use of oils too heavy or too impure for engine consumption is recommended for general industrial use. Difficulties of burning have been nearly overcome in Great Britain and the relative values of the fuels remain a financial problem only. C. C DAVIS (*C. A.*)

9. The use of pulverized coal. PAUL FRION. *Monit. papeterie française*, **52,** 327–8, 364–8, 409–11, 510–1, 578–9, 618–20, 681–4(1921).—A detailed analysis of the advantages and disadvantages of pulverized coal at the present time. A. P.-C. (*C. A.*)

10. Engineers for firing technique in the ceramic industry. R. CLAUSE. *Tonind. Ztg.*, **44,** 787(1920).—The writer emphasizes the importance of the field of heat engineering.

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11. Mining and purifying clay. J. S. HIGHFIELD. U. S. 1,366,456, Jan. 25. A stream of H_2O is forced against a clay face, the resulting liquor is led to a collecting vessel and the liquor in the stream is returned against the clay face until a sufficient concn. is attained. The liquor is then passed to a settling plant, where a small amt. of an electrolyte such as Na_2CO_3 or Na silicate is added and after the liquor has been allowed to settle it is pumped to a treating plant for extg. clay from it by electrolytic treatment. (*C. A.*)

12. Bearing of vitrified shale. H. R. STRAIGHT. U. S. 1,360,244, Nov. 23.

Machine bearings are formed of natural shale by cutting it to the desired shape of the bearing, gradually heating it to the point of vitrification and then cooling. Bearings thus formed are stated to be suitable for use with steel shafts in adding machines or clocks. (*C. A.*)

13. "Artificial slate." E. Fahrig. U. S. 1,362,563, Dec. 14. A mixt. adapted for making roofing tiles or tool handles is formed of powdered slate 41, SiO_2 11, S 15, "magnesite" (MgO?) 10, talc 9, kaolin 8, and sericite 6 parts, mixed with $AlCl_3$ or $MgCl_2$ soln. (*C. A.*)

Apparatus and Instruments

14. Measuring the gloss of paper; apparatus. L. R. Ingersoll. *Optical Soc. of Amer.*, **5**, 213–17(1921).—The instrument measures the propn. of light which is polarized by reflection from the surface, as this is the portion regularly reflected. The scale of deg. of gloss is an arbitrary one, being the reading in degs. of the position of an analyzing nicol. Although the instrument gives the optical, as distinct from the mech. gloss it is found that the two are closely connected. Applications to *enamel* and *whiteware* surfaces are not discussed. (*Sci. Abs.*)

15. Water jet sand washers. Anon. *Tonind. Ztg.*, **44**, 1270(1920).—A description of the Korting app.

16. The current-temperature relation for different pyrometer filaments. W. E. Forsythe. *Frank. Inst. J.*, **191**, 838–39(1921).—A test of the current-temp. relation was made in the case of tungsten and carbon pyrometer filaments and the ratios of currents were found to be very nearly the same for the temp. range from 1828°K to 950°K if the filaments were long enough so that the cooling due to end losses was negligible. Hence a pyrometer lamp with a carbon filament is not superior to a tungsten lamp in openness of scale. (*Sci. Abs.*)

17. The exposition of apparatus for the control of combustion organized by the Office Central de Chauffe Rationelle (March 12–25, 1921). Ch. Berthelot. *Rev. metal.*, **18**, 389–418(1921).—A detailed discussion, with many cuts, of some of the instruments displayed (recording manometers, gas meters, meters for liquids, steam, and coal, thermometers and pyrometers, gas analysis app., fuel calorimeters). The application of the data furnished by the instruments, and in some cases the theory of their operation, is discussed at length. A résumé is given of the work of the "Office central de chauffe rationelle." Donald W. MacArdle (*C. A.*)

18. A furnace temperature regulator. H. S. Roberts. Geophys. Lab. *J. Wash. Acad. Sci.*, **2**, 401–9(1921).—White and Adams' method (*C. A.*, **13**, 2304) of using furnace heating coil as a gigantic resistance thermometer in temp. regulation was followed with an attempt to substitute a better operating device. A galvanometer making direct elec. contacts with the boom is sensitive enough; two relays, one of them polarized, did the rest. Failure or sticking of the contacts gave trouble, which was avoided by putting in series with the galvanometer the secondary of a transformer whose primary current is

changed by each change in the relay current, thus giving a kick which throws the galvanometer boom away from the contact as soon as the relays are set. A lamp flasher in the primary circuit also gives occasional kicks in both directions, insuring against any lasting failure to either make or break of contact. The regulator holds its furnace coil resistance const. to an amt. corresponding to 0.1° for hrs., even with 6% variation in line voltage.

W P. WHITE (*C. A.*)

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19. Analyzing gases. S. A. S. KROGH and P. H. PEDERSON. Brit. 169,130, May 10, 1920. Relates to app. for the automatic measurement of each of 2 or more constituents of a gas mixture, *e. g.*, CO_2 and CO in flue gases, etc. Two or more gas-analyzing units, each comprizing a "first" measuring vessel, an absorber, and a "second" measuring vessel, are connected in series, and the 2nd and subsequent "first" measuring vessels are adapted to restore the original vol. of the sample by the addition of air to the indrawn gas; direct readings in per cents and of reasonable accuracy are obtained. (*C. A.*)

20. Thermocouples, etc. W. C. HERAEUS GES. Brit. 168,977, June 9, 1920. Addition of 138,648(*C. A.*, **14**, 1806). Metals and alloys for thermoelec. purposes are melted and refined *in vacuo*, as described in the principal patent. The alloys used may be obtained from chemically pure metals. (*C. A.*)

Chemistry, Physics and Geology

21. Weldability of solid powders by pressure T. v. HAGEN. *Zeits. Elektrochem.*, **25**, 375–86(1919).—Expts. are made with a great number of pure inorg. substances (oxides, salts, sulphides, *quartz*, graphite), both hydrated and anhydrous, to ascertain whether they can be compressed to cohesive tablets or cylinders, and how appearance, hardness, and strength of the product depend upon the melting point, hardness, grain size of mat., upon the pressure, nature of binding agent (mostly water) and other conditions. The mats. were powdered (25 meshes per sq. mm.) and subjected generally to a pressure of 500 kg./cm.², small cylinders (0.5 gm. or less) being formed; in special expts. the pressure was raised from 560 to 9800 kg./cm.² The crushing tests of the products were pushed up to 230 kg./cm.²; harder tablets were tested by the sclerometer. The mats. are distinguished as non-weldable, powdery, smooth, homogeneous, plastic. Soft mats. (hardness up to 1.5) are generally plastic with hardness 1.5 to 2.5 homogeneous or smooth. Fine grains cohere better than coarse grains. As the melting point rises, the weldability decreases. Oxides give powdery bodies of low strength. Quartz and barium do not cohere at all. The d. increase with pressures may be regular (kaolin up to 7000 kg./cm.²) or more rapid at first than later; homogeneous bodies soon reach a max. d. In general weldability and plasticity (depending upon the number of gliding planes) go together. (*Sci. Abs.*)

22. Viscosity measurements. O. FAUST. *Zeits. phys. Chem.*, **93**, 758–761 (1919).—In detg. the viscosity of highly-viscous materials by the method of Cochius, an air bubble is introduced into a vertical tube, about 50 cm. high

and the rate of ascension of the bubble is measured. In such tests the width of the tube is not stated, as a rule. F. shows that for fairly wide tubes (15 to 21 mm. diam.) the tube diam. should be, and is, of no influence, and that in such tubes the size of the bubble is also immaterial, provided the bubble be approx. cylindrical and not pointed. In narrow tubes slight discrepancies may arise, because the bubble diam. $2r_1$ is a little smaller than the tube diam. $2r$, so that $(r + r_1)$, a sum entering into the calculations, is not quite equal to $2r$.
(*Sci. Abs.*)

23. Systems of color standards. A. AMES, JR. *Optical Soc. of Am.*, **5,** 160–70(1921).—Devices for enabling the color of any object to be detd. may be based either on the use of a colorimeter or a standard composed of colored cards. The latter method is much simpler and is considered in this paper. Such a standard must satisfy requirements as regards arrangement, nomenclature, number, spacing and standardization. All colors may be defined in terms of *hue* (wave length), *chroma* (saturation), and *value* (brightness). Munsell has devised the most perfect representation of colors in terms of these factors. In arranging the system, it is preferable to keep the value constant with changing color and saturation. Accordingly, all colors of the same hue or wave length are arranged on one chart, and a series of charts is provided. In the Munsell system *hue* is designated by a letter, *value* by a number above a line *t* to the right of the letter, *chroma* by a number below this line. The author concludes that there should be 50–80 steps in hue, 70–100 in value, 35–50 in chroma giving a total of about 13,000 different cards for complete analysis. As regards spacing, the deg. of sepn. should be the same throughout the entire system. Standardization should be effected by calcg. the 3 constants for each card and obtaining the conditions with a colorimeter, the results being produced on cards. In conclusion the author discusses Redway's system, which is probably the most used today, but does not completely satisfy the conditions prescribed for a color-standard.
(*Sci. Abs.*)

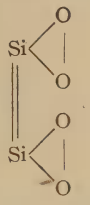
24. Molecular heats at very high temperatures. H. v. WARTENBERG AND G. WITZEL. *Zeits. Elektrochem.*, **25,** 209–12(1919).—By burning in a bomb calorimeter Mg in the presence of a varying amt. of MgO the sp. ht. of MgO can be computed. The following results (±10–20%) for mol. ht. capacity (small cal.) at the abs. temps. indicated were obtained. MgO, 10.2, 415°; 14.5, 1683°. CaO, 11.6, 559°; 13, 1369°. Al_2O_3, 10.8, 230°; 29, 1308°.
ED.

25. Silicic acid as a medicine. ANON. *Tonind. Ztg.*, **44,** 431(1920).—See TRANS., **19,** Abs. 132 (1920).

26. Studies on sedimentation. P. RONA AND P. GYÖRGY. *Biochem. Zeit.*, **105,** 133(1920).—Non-electrolytes have marked influence on the sedn. velocity of kaolin.

27. Atomic grouping and the optical rotation of quartz and sodium chlorate. J. BECKENKAMP. *Zeits. anorg. Chem.*, **110,** 290–310(1920).—The author discusses chiefly *quartz, christobalite* and *tridymite* and the influence of temp.

on these modifications and on their twinning. The twins are either of the Dauphinée type (both crystals of a pair alike) or of the Brasilian type (the two crystals differing as the left and right). Referring particularly to Groth, Sohncke and W. H. Bragg, he conceives that the 3-point helix is due only to the introduction of oxygen and not characteristic of silicon. The spiral grouping of the layers at right angles to the intermediate axes goes together with a spiral arrangement for layers at right angles to the main axes. The silicon atoms form a rhombohedral lattice; the disposition of the oxygen atoms is such that the orientation of their valency directions is the same in horizontal and vertical layers. The silica molecule is probably double, with the 2 Si vertically above one another. In the right- and left-handed crystals



the molecules are enantiomorphs of one another. Heating favors twinning of the Dauphinée type, not of the Brasilian type; that indicates that the Si and O of the same molecule are more strongly linked and less easily displaced than 2 molecules are. (*Sci. Abs.*)

28. Heating-curve study of rapid low-temperature reactions: barium oxides. J. A. Hedvall and N. v. Zweigbergk. *Zeits. anorg. Chem.*, **108** 119–36(1919).—Hedvall [*ibid.*, **104**, 163–68(1918)] had shown that while pure barium peroxide BaO_2 decomposed into oxide and oxygen at 800°, it liberates oxygen as low as 200° in the presence of silica. In the present paper it is shown that similar catalytic reactions take place in the presence of a great number of oxides (not only of acid character), and that there may be decomposition of the peroxide without formation of a compd. The expts. are made with masses of about 5 gm. in porcelain crucibles heated in gas furnaces, temps. being measured every 10 sec. by thermal couples. Of the oxides investigated, SnO, SnO_2, ZrO_2 had no effect. A purely catalytic oxygen liberation, without chem. reaction, was observed with CuO, MgO, CaO, CdO; mixed crystals might be formed. The oxides Ar_2O_3, Sb_2O_3, Cr_2O_3, Fe_2O_3, the various oxides of Mm, Ni, Co(?) were themselves higher oxidized; in the cases of Cu_2O, V_2O_5, Sb_2O_3, Cr_2O_3, MnO_3, MnO, the reaction velocity became enormous, between 200° and 300°. Alumina gave aluminate; lead oxide (litharge) did not liberate oxygen until near 500°, yielding a barium plumbate. (*Sci. Abs.*)

29. Cohesion. H. Chatley. *Phil. Mag.*, **40**, 213–17(1921).—C. proposes the empirical cohesion formula for the mean cohesions of hypothetical atom spheres, $t_2 = G_m^2/d^{2+n/k}$, where n is between 4 and 5, t_2 is the cohesion bond, k is the ratio (>1) of mean atomic interval to that at absolute zero, while

G, m, and d are as in the Newtonian formula, for gravitational force. The mud resists erosion until the hydrodynamic tangential drag on a surface particle equals about 10^{-6} dyne; *i. e.*, each particle, containing some millions of molecules, is retained by at least one intermolecular cohesion bond, with the result that fine mud beds are not easily eroded, whereas coarser sand is easily moved. Also colloidal suspension and plasticity in gels becomes of importance when the wt. of particles is about equal to one inter-molecular cohesion bond, *e. g.*, with cubic particles, sp. gr. 2.5, each has a diameter $d = 10^{-6/2.5-1} \times 981)^{1/3} = 9 \times 10^{-4}$ cm. This agrees with the dimension usually assigned as a max. to colloidal particles. (*Sci. Abs.*)

30. Liquefaction of carbon. E. Rishkevich. *Z. Electrochem.*, **27,** 445–52 (1921); cf. *C. A.*, **15,** 1432.—Pure C has been melted at ordinary pressure. Under favorable conditions (high current and good isolation) C can be brought into a molten state by using low c. ds. The drops formed on allowing molten C to cool consist of pure graphite. The sublimation point of C at ordinary pressure lies not far from its m. p. In satd. C vapor unusually large and excellent crystals can be formed. H. S. C. (*C. A.*)

31. Kaolin in North Carolina, with a brief note on hydromica. W. S. Bayley. *Econ. Geol.*, **15,** 235–46(1920).—The kaolins are found in pegmatite veins in the mountain regions and as blanket deposits derived from broad areas of igneous or metamorphic rocks in the Piedmont plateau. The downward gradation of the kaolin into pure feldspar in the pegmatic veins and retention of the characteristic texture of the pegmatite show that the kaolin occupies the place of the feldspar in the original pegmatite. Of the 3 generally accepted kaolinization processes of feldspar, it is believed that the true one in this case is downward traveling H_2O bearing dissolved CO_2 and org. matter along feldspathic dikes. The alteration of minerals other than feldspar includes soln. of quartz in some cases, possibly by alkalies. Beryl changes to scaly mica and kaolin. Biotite, hornblende, tourmaline, and other ferruginous minerals have altered to chlorite and hydrated micaceous minerals, limonite, and other Fe oxides, and to an Fe carbonate. A good specimen of so-called "hydromica" gives unsatisfactory and generally indefinite optical and chemical data and is believed to represent an aggregate of fine-grained decompn. products embedded in a matrix containing residual muscovite. Owing to water and increasing feldspar content the dikes can not usually be worked for kaolin to a greater depth than 95 feet. Analysis of feldspars, kaolins, and hydromica are given. A. B. Peck (*C. A.*)

32. Studies on the gel of silicic acid. R. Schwarz. *Kolloid-Z.*, **28,** 77–81 (1921).—A review of S.'s work (*C. A.*, **11,** 764; **14,** 1083, 1942; **15,** 214) with special reference to the colloidal phases. H. I. Mattill (*C. A.*)

33. Chemistry of the earth's crust. Henry S. Washington. Geophysical Lab. *J. Franklin Inst.*, **190,** 757–815(1920). (*C. A.*)

34. Adsorption of gas by charcoal, silica, and other substances. Henry Briggs. *Proc. Roy. Soc.* (London), **100A,** 88–102(1921).—The method of detg. the adsorptive capacity of a substance at liquid-air temp. is described,

and results are given of the capacity of silica and certain charcoals. They are compared, especially as relates to N and H, to illustrate preferential adsorption and to show the influence of chem. compn. on gas adsorption. The effect of compressibility of the initial layer, when the d. of the adsorbent is detd. by the immersion method, is considered. An evaluation is made of (*a*) vol. of solid matter, (*b*) that of the interstitial space between the granules, and (*c*) that of the internal gaseous space for silica and coconut charcoal. A high capacity silica may be deactivated, and in the inactive state remains porous. The evidence leads to the conclusion that de-activated silica is vitreous. It is argued that a vitreous solid, like a crystal, is a polymer, *i. e.*, a complete at. linkage. The importance of distinguishing between the coarser capillaries or canals and the finer interpolymeral openings of an adsorbent is emphasized. Activation is considered to be the effect of disrupting the solid polymers, and the means of accomplishing the partial depolymerization of charcoal and silica is described. E. P. WIGHTMAN (*C. A.*)

35. Determination of the valence scale of iron, cobalt, nickel, copper, manganese, tin and tungsten by means of water vapor equilibrium, and the dissociation pressure of the oxides of these metals. LOTHAR WÖHLER AND O. BALZ. *Z. Elektrochem.*, **27**, 406–19(1921).—The H_2O-vapor equil. over the phases Fe_2O_3/Fe_3O_4 and Fe_3O_4/FeO has been detd., at several temps., by the reduction of the higher and the oxidation of the lower stage (*i. e.*, from both sides), with a modified form of the app. previously employed by W. and Prager (*C. A.*, **12**, 554). Quant. measurement of the accompanying quantity of H and the detn. of special equil. for each oxide show that the stability of the oxides of Fe follows the order of chem. valence: Fe_2O_3, Fe_3O_4, FeO. It has been found that FeO is formed at red heat from Fe and H_2O, and not a mixt. of Fe and Fe_3O_4. In agreement with Hilpert and Beyer (*C. A.*, **5**, 2785), it has been found that reduction of Fe_2O_3 first begins between 280 and 330°, according to the mode of prepn. of the oxide. The heat of reaction of the processes, $Fe+O=FeO$ and $3FeO+H_2O=Fe_3O_4+H_2$, has been calcd. by means of the van't Hoff equation for the reaction isochore for different temp. intervals. The dissoc. pressure of the different oxides has been calcd. from the equil. consts. and the formation consts. The values obtained are very small, and for the oxides of Sn, of Fe and of W, have values between 10^{-11} and 10^{-12} mm. Hg at 1000°. H. JERMAIN CREIGHTON (*C. A.*)

36. Feldspar in 1920. L. M. BEACH. U. S. Geol. Survey, *Mineral Resources of U. S. Geol., 1920*, Part II, 153–4(preprint No. 18, published Oct. 29, 1921). E. H. (*C. A.*)

37. The estimation of small quantities of lime in presence of large quantities of magnesia. J. S. F. GARD. *Proc. Univ. Durham Phil. Soc.*, **5**, 234–5 (1915).—If the pptn. of CaC_2O_4 takes place in dil. soln. contg. considerable NH_4Cl and dil. AcOH, it is possible to effect satisfactory sepn. of a little Ca from considerable Mg. To a soln. contg. the equiv. of 5 g. MgO in water or dil. HCl, add 5 g. of NH_4Cl and NH_4OH until alk. Filter off the $Fe(OH)_3$, etc., make the filtrate acid with AcOH, using a moderate excess, and dil. to 450 cc.

At the boiling temp., add 50 cc. of a cold satd. soln. of $(NH_4)_2\ C_2O_4$, continue boiling 5 min. and allow to stand 20 hrs. Decant off the supernatant Mg soln., dissolve the CaC_2O_4 in 6 *N* HCl and repeat the pptn. as before beginning with the neutralization by NH_4OH but allowing this ppt. to stand only 30 min. If the ppt. cakes or sticks to the glass repeat the process once more.

W. T. H. (*C. A.*)

38. Physical chemistry of the oxides of lead. I. Solubility of lead monoxide. S. GLASSTONE. *J. Chem. Soc.*, **119**, 1689–97(1921). (*C. A.*)

39. General colloid chemistry. III. The physico-chemical analysis of zirconium oxychloride and of zirconium oxide sols. MONA ADOLF AND WO. PAULI. *Kolloid-Z.*, **29**, 173–84(1921). (*C. A.*)

40. The colloidal state and colloidal terminology. A. A. POLLITT. *Chem. Age* (London), **5**, 586–8(1921).—A review. E. H. (*C. A.*)

41. Preparation of zirconia. ANON. *Chem. Trade J.*, **68**, 1745(1921).—Equal parts zirkite and caustic soda were fused in an iron crucible, the final temp. being visible redness. The product was treated with water, filtered, and the residue treated with HCl and evapd. to dryness. The insoluble material after ignition amounted to 20% of the zirkite used and contained 61% ZrO_2, 29% SiO_2, 1% Fe_2O_3, and 2% Al_2O_3. The zirconia was precipitated from the soln. as the easily filtered basic sulphate. The ppt. was amber colored, easily soluble in conc. H_2SO_4, slightly in HCl and was completely decomposed by boiling with sodium carbonate of ammonia. The hydroxide precipitated by ammonia was dissolved in HCl, evapd. and allowed to cryst. forming needle-like $ZrOCl_28H_2O$. A quantitative separation of zirconia from large amts. of iron was found possible.

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42. Contact body with ceramic material as carrier. V. ZIEREN. Ger. 317,979, Oct. 25, 1917. The contact body consists of a thin-walled porous member provided with channels to permit the passage of gas, and in certain circumstances with projections. The walls are covered completely with contact substance. The thickness of the walls does not exceed 2 mm., and the cross-section is not more than 20 mm. (*C. A.*)

43. Soluble compounds from feldspar. H. S. BLACKMORE. U. S. 1,355,381, Oct. 12. Finely divided orthoclase or a similar material is heated under pressure with a soln. of Al silicofluoride for 3–5 hrs. to form K_2SiF_6. Insol. matter is sepd. and the soln. is allowed to cool to effect deposition of K_2SiF_6. The aluminous residue obtained as a by-product may be employed as a china clay for manuf. of crockery. Na_2SiF_6 and $(NH_4)_2SiF_6$ also may be used instead of $(Al)_2(SiF_6)_3$. This method avoids the disadvantage of corrosive action of HF on the app. such as may occur when H_2SiF_6 is used to decompose silicates. U. S. 1,355,588 relates to a similar method in which $FeSiF_6$ is used as the decomposing agent with or without the addition of $(NH_4)_2SiF_6$, in obtaining sol. compds. from orthoclase, leucite, glauconite or similar minerals. The reaction is preferably carried out under 200 lbs. pressure per sq. in. at a temp. of about 175°. (*C. A.*)

44. Increasing the adhesive properties of alkali silicate solutions. W. DAHSE. Ger. 318,516, Aug. 23, 1918. Alkali silicate solns. are treated with solns. of water-sol. Zn or Cd salts. *E. g.*, to Na_2SiO_3 soln. of 36° Bé., are added gradually, with continued stirring 0.6–1% of $ZnCl_2$ which has been previously dissolved in 10 times its weight of H_2O. At first a gelatinous mass seps. which during the progress of the reaction is converted into a viscous, strongly adhesive mass. (*C. A.*)

45. Aluminium oxide. H. J. GOLDSCHMIDT. U. S. 1,354,824, Oct. 5. Plagioclases of the labradorite-anorthosite series or other materials containing Al and other metals such as Ca, K and Na are treated with HNO_3 and the nitrates formed are subjected to a temp. of about 300° in order to convert the $Al(NO_3)_3$ into oxide without affecting the other nitrates. Cf. *C. A.*, **14**, 1598. (*C. A.*)

46. Magnesium carbonate. B. B. GRUNWALD. U. S. 1,361,324, Dec. 7. Calcined magnesite is hydrated with H_2O and the liquid mass thus obtained is subjected to the action of CO_2 under pressure to produce $MgCO_3$ and $Mg(HCO_3)_2$ in the form of a milky mixt. Calcined magnesite is added to the mixt. as it comes from the digester with an excess of CO_2 in soln. and the mixt. is agitated and heated to ppt. basic Mg carbonate. (*C. A.*)

47. Apparatus for producing magnesium carbonate from calcined magnesite. B. B. GRUNWALD. U. S. 1,361,325, Dec. 7. The app. comprizes a hydrating chamber to which a supply of CO_2 is connected, a heated pptg. device and other devices adapted for carrying out the method described in U. S. 1,361,324 (preceding pat). (*C. A.*)

Refractories and Furnaces

48. The magnesite plant of Austro-American Magnesite Company at Radenthein (Kärnten). K. ENDELL. *Met u. Erz.*, **18**, 597–600(1921).—The plant manuf. dead-burned magnesite and magnesite brick. The raw mag. is calcined (1700°C) in revolving fur. The mag. brick are pressed under 1000 kg. per sq. cm. and fired in a tunnel kiln to 1500°. Total employees number 910. The prod. of d.b. mag. is about 1,115,000 tons and that of mag. brick about 21,000 T. per annum. A Cottrell precip. app. is in process of installation in the revolving fur. ED.

49. On the application of generator gas-firing in the ceramic industry. K. TEICHMANN. *Ber. D. K. Ges.*, **1** (3), 32(1920).—The writer claims that with the recuperative system kiln temperatures up to cone 16 can be obtained, using a gas manufactured from low grade brown coals. The writer also claims that the value of the tar produced in one year would pay for the initial cost of installation.

50. What happens during firing. R. SEYDEL. *Tonind. Ztg.*, **44**, 951(1920).

51. Thermal "balance-sheet" of an annular kiln. R. CLAUS. *Tonind. Ztg.*, **44**, 1009(1920).

52. Firing with artificial draught. H. Sa. *Tonind. Ztg.* **44,** 1045(1920).—Description of grates with injectors and air pipes, nozzle app., adjustable steam distributors, etc.

53. The "Herda" kiln. Anon. *Sprech.*, **53,** 535(1920).—The hot air from the cooling chambers is mixed with the gases of combustion from the chambers under fire, thus insuring complete combustion of all carbonaceous matter before the hot gases reach the ware to be preheated.

54. Practical economies in firing pottery. E. Reutlinger. *Ber. D. K. Ges.*, **1**(3), 20(1920).—A general discussion for the purpose of promoting coöperation between the German Ceramic Society and the Society of Heat Engineers.

55. Heat saving investigation on kilns. E. Reutlinger. *Ber. D. K. Ges.*, **2,** 33(1920).—Field tests were made on 16 annular kilns in diff. ceramic plants. The preliminary results indicate that: (1) the firing period is too long; (2) fuel consumption is too high; (3) firing is irregular; (4) per cent of rejection is too high. In almost all cases the defects can be removed by comparatively simple means. In one case the firing period was reduced from 32 to 24 hours and the chem. constn. of the flame kept under control during both the oxidation and reducing periods. The work is being continued under the auspices of the German Ceramic Society for the purpose of discovering defects and making improvements and of training the workmen, the introduction of systems of control and permanent inspection and supervision of firing.

56. Theory of the carbon gasification process. Wo. Oswald. *Chemiker Zeit.*, **43,** 229–31(1919).—When carbon is gasified on the grate or by the aid of steam in a producer, 8 reactions may take place which may be summed up in 3 equations. (1) $C + O_2 = CO_2 + 97.6$ cals.; (2) $C + 2H_2O = CO_2 + 2H - 18.8$; (3) $C + CO_2 = 2CO - 38.8$. When these reactions take place in the proportions a, b, c, the complete process is: $(a+b+c)\ C + aO_2 + 2bH_2O = (a+b-c)\ CO_2 + 2bH_2 + 2cCO + 97.6a - 18.8b - 38.8c$. The presence of CH_4 and of N is disregarded. Only 2 of the 3 quantities a, b, c, are independent variables. They are detd. by analyses and the results are plotted by the triangular coördinates of Gibbs. The triangle is divided into regions of combustion and gasification, and of regeneration. The author shows how isothermals and isocalorics are diagrammatically represented, and how the chemist may det. the thermochemical and volumetric characteristics of combustion under varying working conditions, the amt. of coal consumed, the heating value of the gas produced, etc. (*Sci. Abs.*)

57. Refractory crucibles. Anon. *Metal. Ind.*, **17,** 369(1920).—Crucibles can be manufd. by tapping plastic mixts. of highly refractory oxides into fire-clay mould lines with plaster of Paris and then firing the crucible and the mould to a red heat. The crucible can then be removed and given a further firing at high temp. Another method is to use linseed oil as a temporary binder, the crucible being shaped in a metal mould. Crucibles have been made in this way from TiO_2ZrO_2 and CaC.

58. The separation of mineral matter from natural flake graphite. W. C. Ratliff and J. D. Davis. *Chem. Met. Eng.*, **23,** 1027–8(1920).—Expts. show that while graphite flake or amorphous, may be cleaned by agitation with oil and water, light volatile liquids such as C_6H_6, C_7H_8 and CCl_4 are even better. The agglomerates formed with the volatile liquids are less viscous and the mineral matter is sepd. with less agitation than in cases where heavy oil has been used. Fineness has a direct bearing upon the effectiveness of the cleaning. W. H. Boynton (*C. A.*)

59. Stability of conducting (electric) furnace hearth structures. F. Hodson. *Elec. Rev.* (Chicago), **79,** 911–2(1921).—The conductive hearth of the Greaves-Etchells furnace has given exceptionally good service. One of the furnaces installed in June, 1907, has worked continuously with the production of thousands of casts and is still in operation on the original hearth. In one of the large works the practice is followed of chipping out about 4 or 5 in. of the top surface of the hearths once a month and re-ramming new material in. This is done more as a metallurgical precaution to insure clean steel, but the real linings of these furnaces have not been changed for years. There is no doubt that a hearth of this type, when intelligently installed and maintained is practically permanent. In the Greaves-Etchells furnace, 2 phases of the 3-phase current are taken through top electrodes and the third phase is connected directly to a Cu plate lying underneath the lining. No studs project into the lining, and after putting a few inches of special C compd. over the Cu plate, the whole lining of standard *dolomite* or *magnesite* is rammed in with sufficient tar to bind. Details are given. C. G. F. (*C. A.*)

60. Silica brick for coke ovens. A. H. Middleton. *Colliery Guardian*, **122,** 1203–4(1921).—Silica brick is not used extensively in Great Britain for lining coke ovens as it is in U. S. This is a discussion of the present developments in the use of this material for ovens. Also in *Gas World*, **75,** No. 1946 (Coking and By-products Sec.), 13–17(1921); *Gas J.*, **156,** 630–1(1921). C. A. Davis (*C. A.*)

61. Firing with brown coal. Anon. *Tonind. Ztg.*, **44,** 1148(1920).—Two illustrations are given of a method of firing boilers with step grates.

62. The reconstruction of grates for firing with lignite and briquettes. O. Schöne. *Tonind. Ztg.*, **44,** 1185(1920).

63. Refractories in the steel plant. A. A. Hull. *Iron Age*, **25,** 1377–8 (1921).—A plea for adequate specifications and coöperation between producer and consumer. E. H. (*C. A.*)

64. War experience with refractory bricks in the German navy. Schulz. *Tonind. Ztg.*, **44,** 1047(1920).—Specifs. include the following softening points: cone 34 for grade 1, cone 31 for grade 2, cone 26 for grade 3.

65. The refractory products industry. J. Bied. *Cer.*, **22,** 33(1919); See Trans., **19,** 134(1920).

66. Refractories for electric furnaces. *Iron and Coal Trades Rev.*, **101,** 616(1920).—A symposium held by the Electric Furnace Association, Columbus, Ohio.

67. Firing temperatures attainable with wood. H. SACHSE. *Tonind. Ztg.*, **44,** 709(1920).—The actual temp. reached in practice with dry wood is approx. 1450°C, with air dried wood containing 20% water, approx. 1000°C and with green wood, approx. 700°C.

68. Firing with coal dust—a solution of the fuel problem. C. DEGELOW. *Tonind. Ztg.*, **44,** 752, 767(1920).—A rept. on Amer. experience with powdered coal as a fuel.

69. Coal saving. W. ENGLEHARDT. *Tonind. Ztg.*, **44,** 877(1920).—A few general remarks chiefly concerning the regulation of draught.

70. Heat saving in revolving kilns. E. SCHOTT. *Tonind. Ztg.*, **44,** 781 (1920).—The author recommends a combined rotary-grate, revolving, tubular kiln.

71. Design of open hearth furnaces. A. D. WILLIAMS. *Iron Age*, **105,** 35, 119(1920).—A thorough discussion of the whole subject.

72. A war-time lime kiln. W. HÄNSE. *Tonind. Ztg.*, **44,** 717(1920).

PATENTS

73. Electric insulating compositions. BLERIOT, LTD. Brit. 147,746, July 8, 1920. A compn. for elec. insulation, especially designed for use with elec. heating and cooking app., consists of carborundum with a soln. of K_2SiO_3 or Na_2SiO_3 as a binding medium, with or without the addition of washed sand and powdered quartz or glass. The mixt. is baked at a temp. of 400–500°. (*C. A.*)

74. Furnaces. H. J. F. PHILIPON. Brit. 164,746, May 30, 1921. Thin tubes of fused quartz are employed in the construction of regenerators. (*C. A.*)

75. Making films of silica, alumina, etc. M. DE ROÏBOUL. Brit. 169,136, Nov. 19, 1920. Relates to drawing films of SiO_2, Al_2O_3, or like refractory substance having a thickness of the order of 0.001 mm. and a width of about 6 cm. Such films are strong and flexible. The app. employed is generally similar to that described in 165,052 for the drawing of filaments. Pairs of parallel wires of Ir, etc., passed over pulleys and wound on a drum draw up a film from a bath of the molten material. The drawing may be started by a cross wire. The wires may be cut away from a film when it is subsequently unwound from the drum, or they may be severed from it as it is wound on to the drum. (*C. A.*)

76. Refractory material. O. HUTCHINS. U. S. 1,362,316, Dec. 14. A refractory material suitable for furnace linings, crucibles or muffles is formed of a burnt mixt. of zirconia and alumina. (*C. A.*)

77. Basic refractory composition. H. P. BASSETT. U. S. 1,360,355, Nov. 30. A basic refractory compn. suitable for lining open-hearth furnaces or Bessemer converters is formed of magnesium limestone 100, Fe scale or oxide 1–2, NaCl 2 and SiO_2 2–10 parts, heated to a high temp. and prepd. in granular form. (*C. A.*)

78. Improvement of furnace using gaseous fuels. A. C. IONIDES, JR. Japan 35,862, Feb. 21, 1920. (*C. A.*)

79. Furnace lining. J. F. Mollen and W. W. Patnoe. U. S. 1,356,336, Jan. 11. A material adapted for lining furnaces is prepd. by making a slurry of raw dolomite, adding a small per cent of NaCl and then passing the mixt. through a rotary kiln operated at a temp. sufficiently high to calcine the dolomite and volatilize the NaCl. The presence of the NaCl serves to maintain the material in granular form. (*C. A.*)

80. Temperature-control devices for electric furnaces. E. F. Collins. U. S. 1,391,996, Sept. 27. Automatic devices are specified for successively maintaining different predetd. temps. in elec. furnaces such as those used for heat-treating steel or other metals. (*C. A.*)

81. Insulating and heat-conducting material for electric heaters. R. W. Earle. U. S. 1,358,366, Nov. 9. An elec. insulating and heat-conducting material for elec. heaters is formed of a granular material of high dielectric strength and thermal concd. such as fused Al_2O_3 85% mixed with refractory clay 15% or similar bonding material of high dielectric strength and high fusing point and capable of forming a viscous mixt. with H_2O. (*C. A.*)

82. Refractory and protective coating on furnace linings. E. R. Stowell. U. S. 1,350,343, 1920. Mix 8 lbs. powdered SiC with 1 gal. of a 4% soln. of NaOH with water, stir and add 1 pt. of a 50% Be soln. of sodium silicate.

See Abs. 41.

Abrasives

83. The crystalline characters of calcium carbide. C. H. Warren. Mass. Inst. Technology. *Am. J. Sci.*, **2**, 120–128(1921).—CaC_2 from the elec. fur. is a granular or columnar-cryst. aggregate, geometrically pseudo-cubic, but intricately twinned. True symmetry probably orthorhombic, or perhaps tetragonal. Cleavage perfect in three mutually perpendicular directions. Twinning highly polysynthetic; grains are made up of groups of lamellae, parallel to cleavage or at 45°. Color by transmitted light purplish red or lilac-yellow. Transparent only if less than 0.02 mm. thick. Indices of refraction above 1.75; double refraction above 0.050. (For further details on interference figures, etc., see original.) The reaction with water to form C_2H_2, when it is made to take place slowly, leaves the microscopic structure undisturbed. *Calcium cyanamide* is usually also present. Properties: rhombohedral symmetry and cleavage; colorless; refractive indices: $\omega = 1.60$, ϵ, very large; double refraction unusually large, over 0.35; optically positive.

R. B. Sosman

84. Abrasive materials in 1920. L. M. Beach and A. T. Coons. U. S. Geol. Survey, *Mineral Resources of U. S., 1920*, Part II, 155–9(preprint No. 19, published Oct. 28, 1921). E. H. (*C. A.*)

Stoneware, Whiteware and Porcelain

85. Kaolins and pottery clays in the U. S. A. V. Bleininger *Brick Clay Record*, **60**, 39–42(1922).—Eng. china clay in 1 : 1 clay-flint mixts. has a dry transverse strength of 35 lbs. per sq. in. and an absorption of 24% when fired

at cone 8. In similar mixts. N. Car. kaolin has a transverse strength of 25.5 lbs. per sq. in. and an absorption of 25.5% when fired at cone 8. The primary clays in this country are not always of high quality because of improper refining methods. Fla. kaolin develops a stronger body than Ga. kaolin. For example in 1 : 1 clay flint mixts. Fla. kaolin has a transverse strength of 250 lbs. per sq. in. while Ga. kaolin has a dry strength of 25 lbs. per sq. in. Ga. clays develop considerable cracks and checks in drying. Ball clays may be divided into five classes as follows: (1) Black and dark ball clays containing considerable organic matter, inclined to be sticky and vitrify below cone 8. In 1 : 1 clay flint mixts. the transverse strength is about 475 lbs. per sq. in. (2) Dark ball clays having the same physical properties as class 1 except that they vitrify above cone 8 but not above cone 10. (3) Blue, gray or yellowish clays, much lower in org. matter than the black clay. The dry strength of the 1 : 1 clay flint mixts. have a transverse strength of 350–400 lbs. per sq. in. and vitrify below cone 8. (4) Clays similar to class 3 except that they vitrify above cone 8 but not cone 10. (5) Clays similar to class 3 and 4 but having a transverse strength of 240–350 lbs. per sq. in. and vitrify between cones 11–12. It is desirable for the ball clay to vitrify during the bisque fire since more refractory clays tend to produce more open and less strong bodies which are apt to craze. No clay which fires to a gray should be used. In cream colored clays, however, this tinge may be neutralized with cobalt. The requirements of a good feldspar are as follows: (1) The spar should have a silica content of not over 69%. (2) The potash should not be below 9%. (3) The soda content should not be above 3%. (4) The spar fired at cone 8 should be thoroughly fused but not flatten out or change its shape markedly. (5) The color of the fired spar should show a white and not a gray-black color and should not show an excessive no. of specks. The sagger clays may be classified as follows: (1) Those having a drying shrinkage of 7% and a fire shrink. at cone 8 of 5.5%; absorption at cone 8 2.5%, transverse strength in the dry state of 120 lbs. per sq. in. They have good strength in the first fire but overburn gradually and sometimes soften in subsequent firings. (2) Drying shrink. 6.2%, fire shrink. 3.4%, absorption at cone 8 is 12%, dry strength is 120 lbs. per sq. in. Does not overfire but continues to shrink on firing. (3) Drying shrink. 7%, fire shrink. 6.8%, absorption 2.3%, dry strength 220 lbs. per sq. in. Does not shrink or overfire in repeated firings. (4) Dry shrinkage 4%, fire shrink. 4%, absorption at cone 8 is 15%, strength is 80 lbs. per sq. in.; is quite high in silica and does not overfire. Clays 1, 2 and 3 give best results. H. G. SCHURECHT

86. Stoneware cooking utensils. E. TUSCHOFF. *Tonind. Ztg.*, **44,** 729 (1920).—Description of the process of manuf.

87. Stoneware pipes. ANON. *Tonind. Ztg.*, **44,** 666(1920).—The thinner pipes made in Germany for export have more even and dense bodies than the thick walled ones made for the home market.

88. Clay or stoneware utensils for poultry farms. A. WULF. *Sprech.* **53,** 442(1920).

89. The packing of Gay-Lussac towers. GEORGE SCHLIEBS. *Chem.-Ztg.*, **45,** 1038–9(1921).—Manufd. *stoneware* packing is superior to coke on every count. Such a packing must, however, be as light as possible without crushing under its own wt., must be entirely acid-proof and should possess rough walls. A patented packing consisting of a small cylinder made integral with and inside a larger cylinder is described. F. C. Z. (*C. A.*)

90. Hard stoneware body for electric insulators. ANON. *Sprech.*, **53,** 533(1920).—The following body fires satisfactorily at cone 6–8:

$$\left.\begin{matrix}0.56\ KNaO\\0.44\ Ca(Mg)O\end{matrix}\right\} : 1.6\ Al_2O_3 : 9.2\ SiO_2$$

91. High tension insulator porcelain. W. D. A. PEASLEE. *J. Amer. Inst. E. E.*, **39,** 445(1920).—The subject is discussed under the following headings: (1) mechanical strength, (2) ability to resist sudden changes in temp., (3) porosity, (4) temp. resistivity coeff., (5) Piezo elec. effect, (6) surface leakage as a factor in insulator design.

92. Firing stoneware pipes. W. SCHUEN. *Tonind. Ztg.*, **44,** 1001, 1035 (1920).—A method of arriving at a thermal balance sheet.

See Abs. 14, 119.

Glass

93. Double refraction of glass under pressure. E. AND MME. HENRIOT. *Comptes Rendus*, **172,** 1477–79(1921).—The dispersion produced in crown glass is not independent of wave-length, but it obeys very closely Havelock's law that the expression $n(n'-n''/')/(n^2-1)^2$ is constant where $n'-n''$ is the dispersion produced at wave-length n. (*Sci. Abs.*)

94. Copper ruby glass for casing. J. BALDERMANN. *Sprech.*, **53,** 491 (1920).—A discussion of batch compn. and methods of melting.

95. Copper ruby glass for casing. E. S. *Sprech.*, **53,** 536(1920).—A reply to Baldermann—see above.

96. Circular flattening ovens and lehrs for plate glass, bottles, etc. C. BALDERMANN. *Sprech.*, **53,** 444(1920).—A description with sketch.

97. The manufacture of optical glass. C. J. PEDDLE. *Trans. Opt. Soc.* **23,** 2 (1921–22).—The history of the manuf. of opt. glass is discussed under the headings, (1) *early attempts*, (2) 1790–1886, (3) 1886–1914, (4) 1914 onward. Except for the bibliography the discussion of the 4th period is confined to developments in England. A good outline descrip. of the meth. of manuf. is given. Nine excellent photomicrographs of various types of stones are reproduced. The reln. between properties and compn. are displayed in the following diagrams:

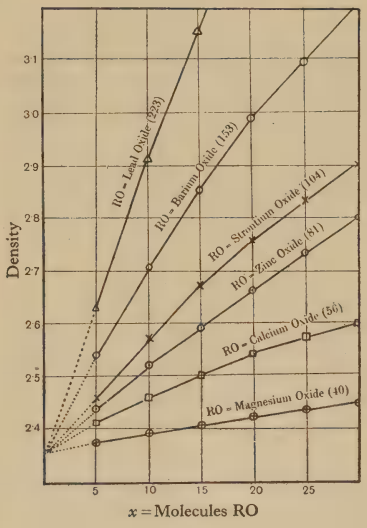

FIG. 1.

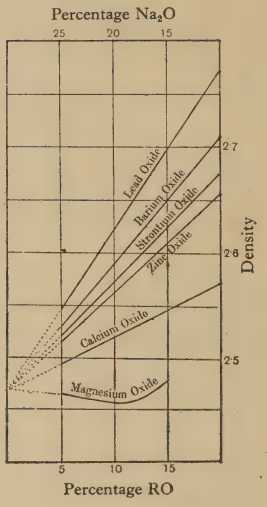

FIG. 2.

FIG. 1.—Relationship between molecular composition and density in the series 100 mols. SiO_2 . 20 Na_2O . xRO.

FIG. 2.—Percentage composition and density (silica constant = 70 per cent).

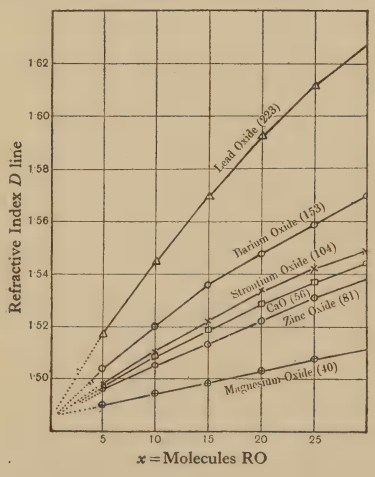

FIG. 3.

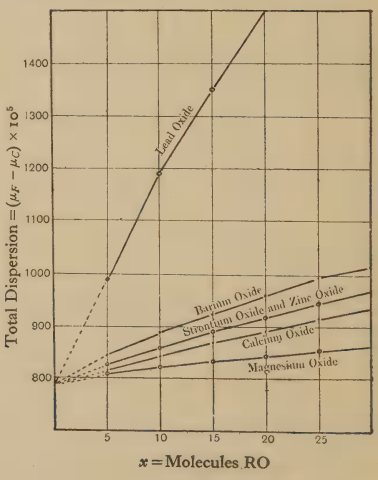

FIG. 4.

FIG. 3.—Relationship between molecular composition and refractive index (μ_D) in the series 100 mols. SiO_2 . 20 Na_2O . xRO.

FIG. 4.—Relationship between molecular composition and total dispersion in the series 100 mols. SiO_2 . 20 Na_2O . xRO.

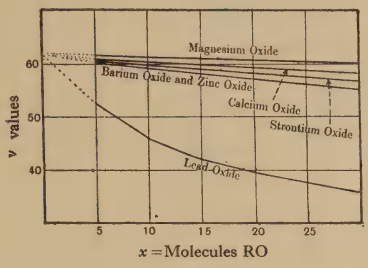

FIG. 5.

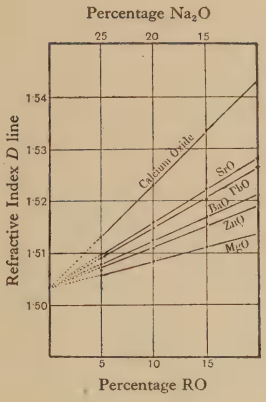

FIG. 6.

FIG. 5.—Relationship between molecular composition and ν value in the series 100 mols. SiO_2 . 20 Na_2O . xRO.

FIG. 6.—Relationship between percentage composition and refractive index. (Silica constant = 70 per cent.)

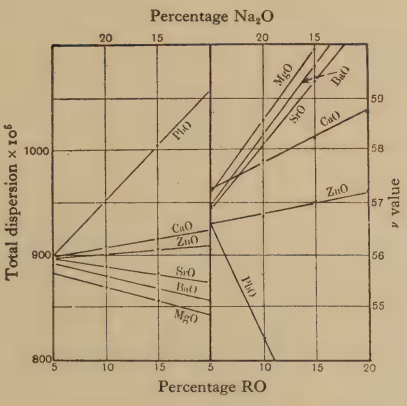

FIG. 7.

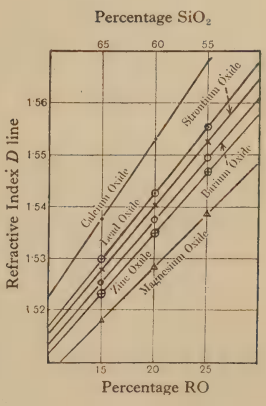

FIG. 8.

FIG. 9.

FIG. 7.—Relationship between percentage composition and total dispersion. (Silica constant = 70 per cent.)

FIG. 8.—Relationship between percentage composition and ν value. (Silica constant = 70 per cent.)

FIG. 9.—Percentage composition and refractive index. (Sodium oxide constant = 20 per cent.)

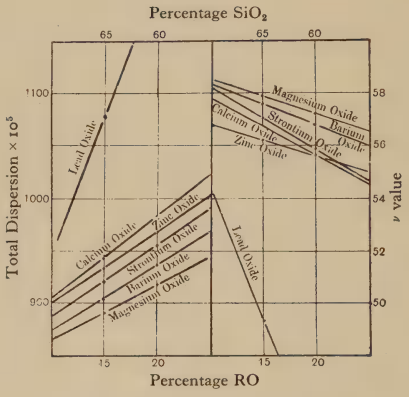

FIG. 10. FIG. 11.

FIG. 10.—Percentage composition and total dispersion. (Sodium oxide constant = 20 per cent.)

FIG. 11.—Percentage composition and ν value. (Sodium oxide constant = 20 per cent.)

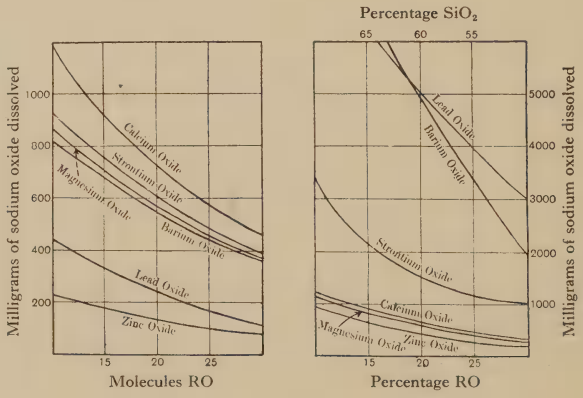

FIG. 12. FIG. 13.

FIG. 12.—Molecular composition and solubility of glasses. 100 SiO_2 . 20 Na_2O . xRO.

FIG. 13.—Percentage composition and solubility. (Sodium oxide constant = 20 per cent.)

98. Strains in unannealed glass. J. Salpeter. *Zeits. techn. Physik.*, I, **10,** 221–24(1920).—This paper gives further theoretical treatment of the case of a quickly cooled sphere of glass dealt with in a previous paper. (*Sci. Abs.*, **1359,** 1920). (*Sci. Abs.*)

99. High-frequency losses in glasses and other dielectrics. E. Schott. *Jahrb. d. Tele.*, **18,** 82–122(1921). (Extract from Dissertation, Jena.)—For detg. the "angles of loss" of dielectrics in high-frequency fields a method was employed in which a direct comparison was made of the condenser (made up with the dielectric to be investigated) with an air condenser free from losses, and previously calibrated resistance. The angles of loss (in minutes of arc) found for the different substances dealt with are given as follows: glass, 1.5 to 90; quartz, 0.4; good mica, 0.6; pressed amber, 18; presspan, about 100. *Temperature effect.*—The increase of the angle of loss with temp. for glasses is very marked. At the highest temp. employed (about 400°C) the loss can be assigned to pure conductivity. At ordinary room temp. the loss calcd. from the d.c. resistance was generally much less than 1% of the observed h.-f. loss. (*Sci. Abs.*)

PATENTS

100. Method of operating optical pyrometers. E. A. Keeler. U. S. 1,379,188, May 24. (*C. A.*)

101. Apparatus for analyzing flue gases. Herbert M. Sharp. Can. 211,201, May 3, 1921. The app. consists of an elec. circuit, a receptacle contg. conducting liquid, in which electrodes are submerged, a conduit delivering gas into the liquid and past one of the electrodes so that the gas bubbles emerging from the conduit press the conducting liquid away from the electrode and interrupt the circuit and means controlled by the circuit for indicating the number of interruptions. A desired number of such receptacles is connected in series, each contg. an absorbent for a particular constituent of the gas. (*C. A.*)

102. Putting the glass industry on a scientific basis. E. Ward Tillotson. *Chem. Met. Eng.*, **23,** 461–5(1920).—A general discussion of the problems of the glass industry with the improvements which have been made, particularly by substitution of continuous and machine processes for intermittent and hand processes. Contributions of American inventors are noted and a plea is made for the scientific coöperation between the practical glass maker and the technologist necessary for adequate plant control and research.

J. S. Laird (*C. A.*)

103. Annealing of glass. L. H. Adams and E. D. Williamson. Geophys. Lab. *J. Franklin Inst.*, **190,** 597–631, 835–70(1920).—In order to anneal glass properly the rate of release of the internal stresses must be known for the various glasses and the various temps. A record is given of such measurements for 9 kinds of glass; and mathematical formulas are derived for calcn. of the release of stress, and for calcn. of the stresses due to heating or cooling various shapes of glass. At any temp., a glass requires a certain annealing time which is arbitrarily defined as the time required to reduce the

stress, in optical units, from 50 to 2.5 micromicrons per cm. The annealing range is the interval of 150° lying immediately below the temp. at which the annealing time is 2 min. Very little permanent stress can be introduced at temps. below the annealing range. Concrete directions are given for annealing various kinds of glass; the best procedure is to hold the glass at a const. temp. at the annealing point for the proper time, then to cool at an increasing rate. JOSEPH S. HEPBURN (*C. A.*)

104. Glass blowing. Internal welding. H. VIGREUX. *Chimie & industrie*, **4**, 334–6(1920).—The difficulties of internal glass welding are discussed and directions for this operation are given. Cf. *Jour. Am. Ceram. Soc.*, **3**, 932. E. H. (*C. A.*)

105. Composition of acid paste. ANON. *Schnurpfeil's Rev. Glass Works* **4**, 669(1920).—This acid paste is recommended for fine designs: Powdered K_2SO_4 11, KF 20, HCl 11, HF 3, flour 22. ROBERT J. MONTGOMERY (*C. A.*)

106. Silica-glass prism for refractometry of liquids at elevated temperatures. F. R. v. BICHOWSKY AND H. E. MERWIN. *J. Optical Soc. Am.*, **5**, 441–3(1921).—A method is given for the construction of a small hollow fused-silica prism for the refractometry of liquids at elevated temps. An elec. heated furnace to be mounted on a goniometer for use with such prisms also is described. Values are given for the *refractive index* and *dispersion of glacial acetic acid*, *α-chloronaphthalene*, and const. boiling *sulfuric acid* from room temps. to near the b. p. F. R. B. (*C. A.*)

107. The manufacture of glass with indigenous alkali. J. P. SRIVASTAVA. *J. Indian Inaustries and Labor*, **1**, 333–40(1921).—Alkali manufd. from a natural Na_2CO_3 occurring during the dry season in India as a surface efflorescence can be used in the manuf. of colored glass, thus reducing the cost by 30%. The incrustations in which Na_2CO_3 predominates are known as "*reh*" or "*sajji-matti.*" The following per cent compn. represents an av. of more than 500 tests: Insol. matter 3.3–8.4, Na_2CO_3 48.2–60.2, NaCl 0.2–4.3, Na_2SO_4 0.3–7.2, H_2O 30.3–38.2, together with a small quantity of org. matter. A careful selection of the deposits is necessary to keep the NaCl content at a minimum. This indigenous soda can be purified on a com. scale to yield a product contg. 90–95% Na_2CO_3 which competes successfully with imported soda ash as a raw material for the production of colored glass.
J. B. PATCH (*C. A.*)

108. Optical glass. F. WEIDERT. *Umschau*, **25**, 534–40(1921); 4 figs.—A brief description in non-technical language of the history and operation of the optical glass firm of C. P. Goerz A.-G. of Munich. J. B. PATCH (*C. A.*)

109. Cornu's method of determining the elastic constants of glass. H. T. JESSOP. *Phil. Mag.*, **42**, 551–68(1921).—Certain errors in Cornu's exptl. arrangement are pointed out, and new measurements are reported for a number of different glasses using an improved method. The change of Young's modulus with time is definitely established. S. C. LIND (*C. A.*)

Heavy Clay Products

110. Standard and tentative methods of sampling and testing highway materials. T. R. Agg and A. T. Goldbeck. Bur. Public Roads. U. S. Dept. Agr., *Bull.* **949,** 1–98(1921).—A full text description is given of the methods which the Committee of the Am. Assoc. of State Highway Officials have recommended as official and which have been approved by the Bur. of Public Roads. W. H. Ross (*C. A.*)

111. Manufacturing cost of bricks. Anon. *Tonind. Ztg.*, **44,** 653(1920).

112. The crushing strength of whole and perforated bricks. Hielscher. *Tonind Ztg.*, **44,** 878(1920).—The author gives figs. showing that the perforated bricks are 20% stronger than the whole bricks, owing to their denser condition and more thorough firing.

113. A chainless carrier. Anon. *Tonind. Ztg.*, **44,** 886(1920).—The app. described handles 200 bricks per min.

114. Brick conveyors. Kr. *Tonind. Ztg.*, **44,** 991(1920).—A description of a method of transporting bricks by rail or canal from works to building site. 4 illus.

115. Bog iron ore. Anon. *Deut. Zieg. Ztg.*, **50,** 325(1919).—The ore may be used for making slate-like appearing glazes such as are used on roofing tiles. Analyses are given. A satisfactory mat glaze can be obtained between cones 3*a* and 10. These glazes might be used for face bricks and terra cotta.

116. Improved methods of brick manufacture. A. Bührer. *Tonind. Ztg.*; **44,** 704(1920).

117. Clays for tiles. Anon. *Tonind. Ztg.*, **44,** 1177(1920).—The main requirements are absence of useless impurities, clearness of the fired color and vitrescibility. The vitrification point should not be near a softening point. A satisfactory clay sintered at cone 1*a* to 6 is free from lime, gypsum and pyrites, and is moderately refractory. Thoroughly vitrified ware requires a uniform body.

PATENT

118. Alumina from clay. V. M. Goldschmidt and O. Ravner. U. S. 1,357,089 Oct. 26. Clay or kaolin is calcined at a red heat, lixiviated with HNO_3 to form an Al nitrate soln. and the latter is converted into alumina by calcining or pptn. with NH_4OH. (*C. A.*)

See Abs. 55.

Enamels

119. Anti-corrosive chemical engineering plant. Pumps for corrosive liquids. Anon. Eng. Dept., Guthrie & Co., Accrington, Eng. *Canad. Chem. Met.*, **5,** 341–44(1921); *Engineering*, **110,** 253–54(1920).—Describes centrifugal pumps and other equipment lined with a new ceramic, acid- and heat-resisting coating, called ceratherm, which resembles porcelain. The ceram. lining is cast in the desired form and cemented into place with an acid-proof cement. It is a good heat conductor, resists sudden temp. changes, has high tensile strength and is claimed to be superior to all other ceram. coatings hitherto employed. Ed.

120. Enameling. De Dietrich et Cie. Brit. 165,785, June 22, 1921. A current of purified gas is caused to ignite on entering the enameling chamber, and ignition continues in direct contact with the articles to be enameled. In the gas generator one portion of the gas is drawn off and traverses a condenser, which retains the gas tar, oils, and any liquid or solid distn. product, and another portion is obtained by the gasification of undercarbonized coke and washed after deposition in 2 chambers of a very fine cinder. The 2 portions of gas are then reunited in a disintegrator, which also removes the last traces of oil by means of gas tar. The gases pass through a series of safety strainers and, shortly before entering the enameling chambers, combustion commences owing to the introduction of a current of warm air. Combustion is then started and is completed in the enameling chambers. (*C. A.*)

See Abs. 14.

Cement, Lime and Plaster

121. The slaking of lime when mixed with sand. W. Drakebusch. *Tonind. Ztg.*, **44,** 1252(1920).—In the manuf. of sand lime bricks, the amt. of sand to be added in the slaking drum process depends upon the amt. of heat generated by the lime during slaking.

122. Light plaster bricks. Grossheim. *Tonind. Ztg.*, **44,** 1259(1920).—Good hard-coal ash free from dust and coarse pieces is mixed with water and plaster and poured into moulds.

123. The Neuss sand lime brick works. B. Kreiger. *Tonind. Ztg.*, **44,** 862(1920).

124. Carbide lime as a building material. Anon. *Tonind Ztg.*, **44,** 1186 (1920).—By-product lime from the acetylene industry is not satisfactory for building purposes.

125. Utilization of old plaster moulds. E. Kirchheim. *Tonind. Ztg.*, **44,** 1206(1920).—The author suggests their utilization as a substitute for infusorial earth as a packing mat.

126. Burning lime with coal with high sulphur content. Ed. Donath. *Tonind. Ztg.*, **44,** 1260(1920).—The quick lime is contaminated with calcium sulphate.

127. Impermeable cement pipes. Anon. *Tonind. Ztg.*, **44,** 878 (1920).

128. Steam meters for sand-lime brick works. Anon. *Tonind. Ztg.*, **44,** 641(1920).

129. Lime and the sand-lime brick industry. B. Krieger. *Tonind. Ztg.*, **44,** 774(1920).—Production statistics for Germany.

130. Works management in a cement factory. O. Schott. *Tonind. Ztg.*, **44,** 438(1920).

131. The hot method of preparing sand-lime brick bodies. H. Jolig. *Tonind. Ztg.*, **44,** 953(1920).

132. Trass and Portland cement. G. Fredl. *Tonind. Ztg.*, **44,** 1123(1920).

133. The influence of mortar on wall strength. Sasse. *Tonind. Ztg.*, **44,** 969(1920).—Results of measurements with diff. mortars.

134. On the porosity strength and absorbing power of certain calcium sul-

phate cements. Alice B. Taylor and Edith Irvine. *Trans. Cer. Soc.*, **20**, 83–92(1921).—Porosity and absorbing power decrease and strength increases with wt. of plaster relative to water. Retarders such as borax allow the use of high percentages of plaster in the mixts. and the securing of great strength thereby. The rate of absorption of water by the plasters was found to depend more on the grading of the holes than on the actual porosity. The use of 1% borax in certain plasters gave lower porosity but a higher rate of absorption. H. F. S.

135. Quick hardening cement developed by the French. E. C. Eckel. *Eng. News-Record*, **87**, 566–7(1921).—E. discusses a cement which consists essentially of only lime and alumina, the small amt. of silica present being due to impurities in the raw materials and fuel. A typical analysis is lime 50%, alumina 40%, silica, etc., 10%. The cement is made in a small blast furnace charged with coke, limestone and bauxite; and the temp. is sufficiently high to result in fusion, not merely clinkering. One of its advantages is that it hardens rapidly. Test specimens 24 hrs. old show strengths comparable with 28-day Portland cement specimens. Considering the compn. of this fused cement its most remarkable quality, perhaps, is its resistance to sea water and similar solns., for until cement was introduced it was generally considered that the disintegration of Portland cement in sea water was due to its alumina content. Cements low in alumina were favored for marine construction. A railroad used fused cement on a portion of its line along the Mediterranean where normal cements are badly affected by exposure, but this material shows no effects of exposure to sea water. In lab. tests, cubes made with fused cement have been kept in 3 solns. [(1) sea water, (2) satd. $CaSO_4$ soln., and (3) 1.2% $MgSO_4$ soln.] for 9 years and are still intact. Neat briquets made of fused cement to which gypsum was added in all proportions up to 50% have been kept in water since 1908 without the least signs of disintegration. J. C. Witt (*C. A.*)

136. The action of sulfur on cement in the tropics. A. Bruce. *J. Soc. Chem. Ind.*, **40**, 240T(1921).—Earthenware pipes, laid in Colombo, with cement and a ring of "galanack," and disused for several years showed longitudinal and circumferential cracking. The cement had altered in appearance to that of a white plastic putty and the "galanack" lost its original structure. Analyses of the cement at different ages show increase in SO_4 and loss on ignition, and decreases in lime, iron and alumina and sol. SiO_2. The exact conditions for the change depend more on the manner of application of the galanack, while soil factors are negligible. Galanack is a mixt. of S, tar and oil. W. H. Boynton (*C. A.*)

137. Determination of available lime in quicklime and hydrated lime. Alice I. Whitson. *Chem. Met. Eng.*, **25**, 740(1921).—Work done at the Bur. of Standards shows that the Scaife method is satisfactory for the detn. of available CaO. The procedure recommended is as follows: Place 1.4 g. of the powdered sample in 200 cc. of hot water and boil 3 min. Add phenolphthalein and titrate slowly with *N* HCl until the color is discharged and does not reap-

pear within 2 sec. Repeat the expt. using a liter graduated flask carrying a 1-hole stopper fitted with a short glass tube drawn out to a point. Cool and add, drop by drop, within 5 cc. of the vol. of HCl required in the preliminary expt. Break up any small lumps with a flattened stirring rod, dil. to the mark with freshly boiled water, close the flask, mix well and after settling for 30 min. pipet off 200 cc. and finish the titration with 0.5 *N* HCl. The results obtained in the analysis of 5 samples by different operators show remarkable concordance. W. T. H. (*C. A.*)

138. Waste heat installation at cement plant. ANON. *Rock Products*, **24**, No. 23, 13–17(1921).—An illusd. description of a plant at Dallas, Texas. E. H. (*C. A.*)

139. Lime in 1920. G. F. LOUGHLIN AND A. T. COONS. U. S. Geol. Survey, *Mineral Resources of U. S., 1920*, Part II, 178–88(preprint No. 22, published Nov. 3, 1921). E. H. (*C. A.*)

140. A critical review of wet process for manufacture of Portland cement. R. K. MEADE. *Concrete* (Mill Sect.), **18**, 135–143(1921); cf. *C. A.*, **15**, 3732.—M. discusses the number of advantages that the wet process of cement manuf. is usually considered to have over the dry process. His conclusion is that the advantages of the dry process are too marked to warrant the substitution of the wet process for it in most instances and that the adherence of the older and more experienced manufacturers to the dry process has been well founded. The possible saving of the wet process in grinding and drying is much more than offset by the saving of the dry process in fuel, while the advantages claimed for the wet process as to lack of dust and better quality of the product are not borne out by either facts or theories. J. C. WITT (*C. A.*)

141. Shrinkage of Portland cement mortars and its importance in stucco construction. J. C. PEARSON. *Proc. Am. Concrete Inst.*, **17**, 133–47(1921).—(1) Thin mortar slabs, cast in non-absorptive water-tight forms, may show large and irregular vol. changes in the plastic state, depending chiefly upon the distribution and retention of water in the specimens up to the time of final set. (2) The initial vol. changes under these conditions can, therefore, be reduced and controlled within fairly close limits by taking the necessary precautions. (3) The shrinkage which occurs after the mortars have set persists for many months under ordinary lab. exposure, and is more or less characteristic of the mortar mixts. (4) The use of forms with absorptive bases greatly reduces the initial vol. changes, and has a remarkable effect on the shrinkage which occurs after the mortars have hardened. With dry, or slightly wet bases, the characteristic shrinkage is reduced by 25–50% of the shrinkage of similar mortars in non-absorptive forms, whereas with satd. absorptive bases the shrinkage tends to exceed that of similar mortars in non-absorptive forms. (5) The results of the investigation indicate the very important rôle of absorption or "suction" in actual stucco application, and account for the diversity of condition exhibited by the stucco test panels.
J. C. WITT (*C. A.*)

PATENTS

142. Rotary kiln for sintering cement slurry, etc. A. LARSEN. U. S. 1,358,759; U. S. 1,358,760; U. S. 1,358,761, Nov. 16. (*C. A.*)

143. Cement mixture. E. R. STOWELL. U. S. 1,364,004, Dec. 28. A mixt. adapted for manuf. of light brick or tile is formed of coal ashes 50, Na silicate 12, ground talc 8–10 and Port. cement 5–10 parts. The mixt. may be used as a plaster or floor covering. (*C. A.*)

144. Insulating metallic layers. J. J. ZWERLING. U. S. 1,363,074, Dec. 21. Layers of metal such as parts of elec. heating devices (*e. g.*, irons) are insulated from each other by a coating of Na silicate soln. carrying inert material such as SiO_2 or carborundum in suspension when applied and to which is added, after its placement on the metal, additional inert material such as SiO_2 in granular form. (*C. A.*)

145. Silicate cements. W. CARPMAEL. Brit. 168,659, June 4, 1920. Cements for dental and other purposes consist of a base such as Mg or Be oxide mixed with a soln. of hydrolyzed org. Si compd. contg. a high per cent of silicic acid. The org. Si compd., *e. g.*, tetramethyl silicate or a condensation product thereof, may be hydrolyzed by H_2O or dil. acid, either alone or in the presence of P_2O_5 or an alcoholate of an alk. earth metal or of Mg or of Al or both. Examples of prepns. are given. (*C. A.*)

146. Paints; cements. F. BENSA. Brit. 147,800, July 9, 1920. Pyrite ashes are freed from H_2SO_4, pulverized, freed from H_2SiO_3 and ground with linseed oil to form a rust-preventing cement. A paint is obtained by dilg. the pasty cement with boiled linseed oil. (*C. A.*)

147. Purifying molten slag. J. LUND. U. S. 1,366,398, Jan. 25. Molten slag is purified in order to render it suitable for *cement manuf.* or other uses by applying heat to the under surface of slag, *e. g.*, in a horizontal rotary furnace containing molten Fe, while at the same time treating the upper surface of slag with basic or acid ingredients to adapt it for its particular intended use. (*C. A.*)

148. "Artificial stone." M. JUNGHANDEL. U. S. 1,363,879, Dec. 28. Cement is mixed with an aggregate of elastic capsular material such as calcined rice hulls in order to form a material suitable for building purposes having good insulating properties against heat and sound. (*C. A.*)

149. Coloring cement surfaces. L. A. AND A. J. SANDERS. U. S. 1,364,587, Jan. 4. Surfaces comprizing hydraulic cement and rendered alk. by the presence of lime are colored by treatment with an aq. soln. of a sulfate or other salt or Cu, Fe, Zn, Ni or Pb. (*C. A.*)

150. Hydraulic cement and alkali from natural silicates. E. W. JUNGNER. U. S. 1,357,873, Nov. 2. Liberation and volatilization of alkali on heating a mixt. of lime and feldspar or similar mineral substances is facilitated by adding to the charge about 4% or more of carbonaceous material such as coal, charcoal or sawdust, in finely divided condition. On heating the materials to 1250–1450°, K_2CO_3 is volatilized and a cementitious residue obtained. No Ca salts of inorg. acids are used (except $CaCO_3$ which is converted into lime in the initial stage of heating of the charge). (*C. A.*)

151. Building material from plaster of Paris. M. Baer. U. S. 1,357,375, Nov. 2. A building material especially adapted for use in ship-building is formed of plaster of Paris mixed with chips or particles of wood and metal. (*C. A.*)

152. Cement clinker and by-products. S. B. Newberry. U. S. 1,366,479, Jan. 25. A finely ground mixt. of raw cement materials and carbonaceous fuel is heated by external heat of the gaseous products of combustion of a subsequent stage of calcination of similar material, the condensible products volatilized from the fuel are collected and recovered, and the mixt. is finally calcined by the combustion of the fixed C of the fuel and of gas volatilized from the fuel. (*C. A.*)

153. Cement. S. Matsuo. U. S. 1,367,984, Feb. 8. Hot Port. cement clinker is added to sand which has been washed with HCl while the sand is still wet and the mixt. is cooled and pulverized to obtain a cement which is resistant to brine. (*C. A.*)

154. Recovering potassium compounds in cement manufacture. C. Catlett. U. S. 1,354,727, Oct. 5. Recovery of K. compds. in treating a Portland cement mixt. (which may contain feldspar to increase the K content) is facilitated by the addition to the mixt. of 1–5% of a set Ca oxychloride compn. of the sorel cement type. Sufficient of the latter is used to supply Cl to combine with the K to be recovered. The volatilized K values leaving the kiln with the dust may be recovered by simple subsidence, use of wet or dry filters or by elec. pptn. The recovered material may be used as a fertilizer directly or may be leached for the recovery of K compds. in crystd. form. The use of Ca oxychloride is stated to have the advantage over NaCl that the fume and gases produced are much more readily recovered by elec. pptn. and no detrimental effect on the cement clinker is produced. Oxychlorides of Mg and Zn also may be used. The various oxychlorides (including a product formed by treating bittern with $Ca(OH)_2$) may also be used for treating feldspar to produce sol. K compds., with or without simultaneous use or $CaCO_3$, $CaSO_4$ or other auxiliary substances. (*C. A.*)

155. Plastic coating material containing cement. J. C. Dobbins. U. S. 1,355,131, Oct. 12. A coating material in paste form, adapted for use on walls or fabrics, is formed of Portland cement 100, hydrated lime 13, a coloring material and mica 1.3 parts, H_2O and Na silicate soln. (*C. A.*)

156. Asbestos cement building material. R. V. Mattison, Jr. U. S. 1,355,406, Oct. 12. An asbestos cement suitable for building bricks, roofing or flue linings is formed of Portland cement and finely ground serpentine. The serpentine used contains microscopic fibers of asbestos and a considerable propn. of ground quartz. (*C. A.*)

157. Building block. F. J. Kramer. U. S. 1,363,045, Dec. 21. A mixt. for making building blocks is formed of pulverized furnace slag 79.8, cement 20, $KMnO_4$ 0.175 and HF 0.025% mixed with H_2O. The $KMnO_4$ facilitates hardening and the HF prevents discoloration. (*C. A.*)

See Abs. 110.

CERAMIC ABSTRACTS

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General and Miscellaneous

1. Failure of a mortared smoke stack. VN. *Rev. Mat. Constr. Trav. Pub.*, **147,** 225(1921).—A 54-meter smoke stack attached to a rotary cement kiln which had been standing idle for 10 months, was found to be listing 50 cms. at the top, leaning in the direction from which heavy winds were always blowing. The leaning started 14 meters from the top rim. Analyses of the mortar taken from the inclined portion showed the presence of 1–1.5% of SO_3 in the half against the wind while the opposite half had 7–12% SO_3. It is conjectured that the far side of the rim became soaked by the driving rain and that the wetting then continued on that side downwards. Sulphur from fuel that was deposited on the chimney lining combined with the lime of the mortar forming gypsum mostly on the side further away from the wind. The swelling of the plaster caused the stack to list. A similar case in Sweden is also cited. LOUIS NAVIAS

2. Belt, gear and chain drives for grinding mills. GEORGE J. YOUNG. *Eng. Min. J.*, **112,** 969–71(1921).—Describes installations and discusses merits and faults of these drives as used in ore grinding. S. L. GALPIN

3. Importance of the mineral industries. EDITORIAL. *Eng. Min. J.*, **112,** 681(1921).—During quarter ending June 30, 1921, railroads of U. S., hauled 222,000,000 tons freight. Coal and coke 89,000,000; stone, clay, gravel, sand 23,000,000, iron ore 9,000,000,000, crude petroleum 1,000,000; agricultural products 21,000,000; animals and animal prod. 6,000,000; forest prod. 20,000,000; manufactured prod. and misc. 42,000,000. S. L. G.

4. The Bureau of Mines and Private Investigations. H. FOSTER BAIN. *Eng. Min. J.*, **112,** 450–3(1921).—Details conditions under which the Bureau may coöperate with industries and individuals for research and investigations. S. L. G.

5. Preparation of Fuller's Earth in Florida. STRAUSS L. LLOYD. *Eng. Min. J.*, **112,** 860.—Fuller's earth is found in 6′ to 20′ strata of Upper Oligocene age in Gadsden Co. (North Fla.) and Manater Co. (South Fla.). 12′–14′ overburden is stripped and usually only upper half of earth bed is removed. Raw material is crushed, dried, bolted and bagged. For clarifying petroleum products 15–30, 30–60, and 60–80 mesh sizes are sought. For vegetable oils finer material may be used but very fine condition is undesirable. Ark., Colorado, Calif., Ga., and Mass., are also producing states. S. L. G.

6. Large production of Fuller's Earth in 1920. *Eng. Min. J.*, **112,** 410.—Figures taken from *Min. Res.*, **1920,** U. S. Geol. Survey. S. L. G.

7. Incinerator for mill refuse made of brick and concrete. H. Ludwig. *J. Elec. Western Ind.*, **47**, 473(1921).—The incinerator consists of a concrete shell with fire brick lining 14 ft. in diam. at the base and 60 ft. high. The feed pipe is 18 in. in diam. and as much as 400 cu. yds. of refuse can be consumed per 9 hrs. Full details of construction are given. The temp. of the combustion chamber ranges between 800° and 1100°. C. G. F. (*C. A.*)

8. Review of the most important German patents on flotation with special reference to the patents of Mineral Separation, Ltd. J. Friedmann. *Metall u. Erz*, **18**, 431–37 (1921). R. S. Dean (*C. A.*)

9. Insulating materials. S. Halen. *Kunststoffe*, **11**, 137–9(1921).—Review of German patents. C. J. West (*C. A.*)

10. The preparation, transportation and combustion of powdered coal. J. Blizard. Can. Dept. Mines, Mines Branch, *Bull.* **564**, 131 pp.(1921).—This is an extensive treatise, with 39 figures of machinery and plant, and many quotations from recent literature. The subjects treated are: suitable coals; drying and pulverizing; storage and distribution; mixers and burners; use for steam-raising; other uses; cost of plant and of prepn.; safety. The material is mostly compiled; but some results of boiler tests are given. Powd. coal shows a high efficiency in use, due to the very low combustible in the ash and the high CO_2 content of the flue gas. The cost of prepn. and delivery to the furnace is said to be from 50 cents to $3.00 per ton. Ernest W. Thiele (*C. A.*)

11. Complete gasification of coal. A. W. Warner. *Proc. Am. Gas Assoc.* (1921 Convention), Sep. 36 pp. bibliography.—W. reviews the method of complete gasification in 1 machine but in 2 or more chambers as found in Smith's adaptation of Kramer and Aart's double gas plant, and the Tenney process which utilizes bituminous coal for production of carburetor water gas; the method for partial gasification in one machine and chamber as exemplified in steaming of continuous vertical retorts (Beilby, *C. A.*, **15**, 2711); and complete gasification in 2 stages, as found in coal carbonizing plants with blue gas plant or carbureted water gas plant using the surplus coke. With the latter method applied to intermittent verticals at Rochester making coal gas and blue gas, the cost per therm. for the first stage for 8 months of 1921 including fixed charges, based on the price of coal, of 14 cents per M. cu. ft., was 8 cents, while for the 2nd stage with fixed charges of 2.75 cents was 9.2 cents. Since gaseous B. t. u.'s are sold with more profit than B. t. u.'s in form of coke, it looks as if our future choice would lie between rich coal gas dild. with blue water gas and balance of coke completely gasified and the gas enriched with oil. J. L. Wiley (*C. A.*)

12. Boiler plant efficiency. V. J. Azbe. *Mech. Eng.*, **43**, 722–4, 726(1921).—The object is to show to what extent boiler-plant wastes are preventable or can be made to balance each other, and to recommend a standard for boiler operation toward which designers and operators may aim. The usual wastes in boiler plants are emphasized by means of tables and curves of boiler performance. 90% efficiency is attainable under favorable conditions, this 90% representing boiler and economizer only. The requirements are severe and with 12,000 B. t. u. coal, 15% excess air would have to be used, flue-gas temp. would have to be no more than 250°F, combustion complete and no C in the ash. The requirements of the ideal boiler installation of today are summarized. J. L. Wiley (*C. A.*)

13. Fuel saving in modern gas producers and industrial furnaces. W. B. Chapman. *Mech. Eng.*, **43**, 717–21(1921).—There are 10,000 gas producers in the U. S. Progress made in the past 25 yrs. in gas-producer construction is shown in descriptions of some of the leading types. Any of these with skilled handling can make a gas averaging 160–175 B. t. u., provided the coal is of fair quality and the rate of gasification does not exceed 25 or 30 lb. per sq. ft. per hr., and with a saving of about 25% in coal and in

labor. A further saving in coal can be brought about by using suitable accessories in the gas house, such as pressure regulators, and a temp. recorder. Besides conserving fuel by proper gasification, further economy can be effected by its proper utilization in the furnace. The recuperative furnace holds the greatest promise in this direction, as its field of application is very broad, it being capable of effective use in both large and small operations and for furnace temps., as high as 2700 and as low as 1400°. From 20 to 40% of the fuel can be saved by using a recuperative furnace, such as the Stein, which preheats the air to within 500°F of the furnace temp. The extension of the use of such a furnace to pulverized coal and oil would also result in similar savings. Also in *Iron Age*, **108**, 1671–2(1921). J. L. Wiley (*C. A.*)

14. Determination of the carbon-dioxide content of flue gases from the firing of steam boilers. H. Winkelmann. *Braunkohle*, **20**, 307–10, 326–9(1921).—After dealing with the important theoretical principles of combustion, the various methods for detg. CO_2 in flue gases are described. An extensive illustrated description is given of the automatic recording app. manufd. by Ados, Ltd. of Aachen. C. C. Davis (*C. A.*).

15. Determination of the carbon-monoxide and carbon-dioxide contents of producer gas. H. Winkelmann. *Wärme u. Kalte-Tech.*, **23**, 229–30(1921).—The gas is first passed through a filter and then through an automatic CO_2 recorder driven by an elec. motor where the CO_2 content up to 20% is recorded. It then passes to a CO filter filled with a colorless powder which completely absorbs the CO_2. This powder becomes red on absorbing CO_2 and remains so until its efficiency is exhausted when it loses its red tint; it should last 1–2 weeks. The gas, which then contains only CO and hydrocarbon, passes into an electrically heated combustion oven containing an oxidation material and is oxidized to CO_2 which is analyzed and recorded in the usual known manner. About 30 such analyses per hr. can be carried out. J. L. Wiley (*C. A.*)

16. Gas manufacture and tar recovery with special attention to carbonization of lignites. Konrad Arnemann. *Gas u. Wasserfach*, **64**, 665–73(1921).—Details are given of construction and operation of plant for gasification of lignite, both in raw form and in briquets. Some data are given in relation to costs, raw material, finished products, and yields. J. L. Wiley (*C. A.*)

17. Modern Pintsch-generator gas plant and results of operation with different fuels. H. Lichte. *Gas u. Wasserfach*, **64**, 635–9, 651–8(1921); 24 figs.—Detailed descriptions are given of the following types of generators built by the Julius Pintsch Co., and their operation together with results of operation: (1) Normal generators with rotary grates, round grates, flat grates, step grates and tap generators; (2) generators for production of tar-free gas with double combustion space or with tar burning, and (3) generators with low-temp. tar recovery. J. L. Wiley (*C. A.*)

18. Smokeless fuel. W. Strafford. *Gas J.*, **156**, 806–7(1921).—An exptl. plant has been working successfully for some time on the production of *Fuelite* from refuse coal materials. A smokeless domestic fuel is made as well as good coke of any degree of quality. The refuse is first ground to $^1/_4$-in. size, mixed with crude tar, pressed into open trays about 18 by 7 in. in size coupled together and then passed slowly through the retort, consisting of a 9-in. steel pipe 50 ft. long and heated by crude tar burned in a special type of tar burner (described with diag.). The success of the plant is largely due to this appliance. From 24 tons of refuse, mixed with tar, 25 tons of Fuelite were produced, having a calorific value of 13,556 B. t. u. per lb.; that made from coke dust 12,952 B. t. u. per lb. J. L. Wiley (*C. A.*)

19. Engineers and chemists. The coöperation of the engineer and chemist in the control of plants and processes. G. M. Gill. *Engineering*, **113**, 57–9(1922). E. J. C. (*C. A.*)

20. Smokeless fuel for domestic purposes. ANON. *Electrician*, **87**, 579(1921).—A brief account of a new continuous oven process. Twenty ovens produce 30 tons of coke per day. They are of the upright type, divided longitudinally into 3 compartments by 2 perforated Fe plates. The retorts are gas-heated. One ton of an av. small slack coal will produce 14 cwt. smokeless fuel, 16 to 18 gals. of tar oil, 6000 cu. ft. of gas, 14 lbs. $(NH_4)SO_4$, 2 to 3 gals. of motor spirit. The coal used in the low-temp. process is generally 2 parts non-coking to one part coking. C. G. F. (*C. A.*)

21. The control of combustion in furnaces. F. MARTIN. *Age de fer*, **37**, 905–8, 992–3(1921).—M. calls attention to the use of a recording differentiation pressure gage between ash bed and firebox for controlling combustion in furnaces.

A. PAPINEAU-COUTURE (*C. A.*)

22. Critical investigation on jig sieves, especially those of Schubert (D. R. P. **235**, 520) **and Schuchard** (D. R. P. **241**, 779). W. GROSS AND W. GOY. *Metall u. Erz*, **18**, 121–26, 152–58, 177–84(1921).—For upper Silesian Zn and Pb ores the grate screen of Schubert is especially good, followed by the Schuchard corrugated screen and the conically perforated sheet. The quality and accuracy of the sepn. depends on the relation of the free openings to the pressure. The force needed is inversely proportional to the free openings. For *coal washing* there is little difference in screens. R. S. DEAN (*C. A.*)

23. Theory of the water-gas process. S. KOHN. *J. Ind. Eng. Chem.*, **14**, 69–72 (1922).—K. discusses the 10 possible and 3 probable combinations of reactions which can be used to explain the water gas process. Demonstration is made of a possibility of drawing conclusions from the compn. of the resulting gases to the actual procedure of the reactions. The applicability of the principles outlined is tested on a series of 9 observations published by Bunte and Harries (cf. Haber, Thermodynamik technischer Gasreaktionen), and their application to catalytic observations is discussed.

J. L. W. (*C. A.*)

PATENTS

24. Supplying steam to gas producers. H. F. SMITH. U. S. 1,397,554, Nov. 22 Steam supply to gas producers is regulated by an automatic valve control system depending upon the sp. gr. of the gas produced. U. S. 1,397,555 relates to similar automatic steam supply regulation depending upon the moisture content of the gas produced. (*C. A.*)

25. Burning liquid fuel in jets. W. N. BEST. U. S. 1,397,791, Nov. 22. A flat fan-shaped spray of liquid fuel such as oil or tar is delivered to a burner by a vaporizing jet of steam or air and burned together with finely divided coal in a flat fan-shaped flame for heating furnaces or oxidizing Cu or other materials. U. S. 1,397,792 relates to an app. for burning liquid and solid fuels together in this manner. (*C. A.*)

26. Clay mixture for earthenware manufacture. C. E. FULTON. U. S. 1,398,014, Nov. 22. A mixt. of good plasticity with a low H_2O content is formed of clay 100, gallic acid 0.02, Na silicate 0.0224 parts, with or without NaOH 0.02 part or a small amt. of other alk. hydroxide. (*C. A.*)

27. How heat losses in chemical plants may be reduced. JOHN PRIMROSE. *Chem. Age* (N. Y.), **29**, 449–50(1921).—A plea for greater attention to proper boiler settings, firing, use of economizers, preheaters, insulation, etc., in order to save fuel. Superheated steam for power generation and for high temp. process work, combination of processes so as to utilize steam as in a step-down transformer, satd. steam for temps. up to 300°F, and oil or other fluid heat transference, are discussed briefly.

W. C. EBAUGH (*C. A.*)

28. Furnace for enameling ceramic or other ware. R. ROADHOUSE. U. S. 1,395,732, Nov. 1. The furnace is adapted to be heated by oil burners. (*C. A.*)

29. Clay-working machinery. WALTER A. GRURNBERG. U. S. 1,394,495, Oct. 18,

1921. In a clay-working machine, a base, a rotatable top thereon, molds on the top, means for rotating the top a quarter of a turn at a time, means for opening and closing the molds, and means for brushing out the molds, means for inserting clay into the molds, means for coring out the molded clay, and means for opening the molds to deliver the molded product at each successive turn of the machine top. C. M. S., Jr.

30. Phosphate-rock-calcining process. Mark Shoeld. U. S. 1,393,839, Oct. 18, 1921. The process of calcining phosphate rock consisting in suddenly heating the material to be treated to the reaction temperature in form approx. from one to 5 seconds to prevent any substantial preliminary detrimental heat action on the material.

C. M. S., Jr.

Apparatus and Instruments

31. A new optical pyrometer for high temperatures. G. Keinath. *Elektrotechn. Z.*, **42,** 1384–6(1921).—A detailed description of the new "ardometer" of the Siemens-Halske Co. It is a total radiation pyrometer, a modification of the Thwing pyrometer. The thermoelement consists of a small piece of Pt foil, 0.007 mm. thick to which the 2 leads, 0.03 mm. in diam., are hard-soldered. On account of the fineness of these wires the element responds and reaches equil. within 10 sec. The element is sealed into an evacuated glass bulb. At 1400° a reading of 15 mv. is obtained. The ardometer is therefore 4 times as sensitive as the Fèry pyrometer. The minimum temp. accurately read is 600°. Numerous applications are described. C. G. F. (*C. A.*)

32. Apparatus for the determination of moisture. F. W. Shulenberger. *Paint, Oil and Chem. Rev.*, **72,** No. 25, 8, 14–5(1921).—S. describes an automatically controlled elec. oven with a revolving shelf on which the samples for test are placed. The method for detg. moisture and sediment in oils given in *Bur. of Mines Bull,* No. **5** and the modified method as improved by Dean and Stark are given in detail.

Donald E. Sharp (*C. A.*)

33. Automatic recording and analytical apparatus. L. Levy. *Chem. Age* (London), **5,** 652–5(1921).—A brief description of recording thermometers and pressure gages, sp.-gr. recorders for gases and liquids, recording calorimeters, total quantity meters, and CO_2 recorders. Simmance's sp.-gr. recorder for gases is more fully described than the others. Donald E. Sharp (*C. A.*)

34. The differences in the measurements obtained on adiabatic and ordinary calorimeters. W. Swientoslawski and Mlles. H. and Z. Blaszkowskie. *Roczniki Chemji,* **1,** 166–70(1921).—Comparative measurements were made on 2 calorimeters, adiabatic and ordinary, under various conditions. The measurements on the adiabatic calorimeter were made when t_o = const., t_n = const., and under adiabatic conditions. Those on the ordinary calorimeter were made both with and without precautions against the evapn. of the water. The results obtained indicated that identical values could only be obtained under adiabatic and isothermic conditions where t_o = const. In all other cases considerable ($\pm$ 0.03% to $\pm$ 0.46%) differences were observed.

J. M. K. (*C. A.*)

35. New alternating current electric furnace installation in Dept. of Electrochemistry, Univ. of Toronto. A. E. R. Westman. *Can. Chem. Met.*, **5,** 224–5(1921).—This dept. has a 200 kilovolt-amp. installation, supplied at 2200 v. 25 cycles, single-phase. Of special interest in the transformer room, are line fuses of 100 amp. 7500 v. limit of the "Sand C" type, CCl_4 being automatically projected into the fuse chamber when fuse melts to prevent arcing. Full elec. details are given. F. H. Hotchkiss(*C. A.*)

36. Recording calorimeters. J. W. Cobb, J. W. Wood, *et. al. Gas J.*, **156,** 197–201, 740–1(1921).—Discussion of and reply to a report on the Simmance calorimeter (*C. A.*, **15,** 3195). J. L. Wiley (*C. A.*)

37. Recording combustible gases. R. Moeller. *Gas Age-Record*, **48**, 904–7 (1921).—Description and operation of *Mono* equipment for use in boiler, water gas, coal gas and coke oven plants are given. Sample recording charts are shown.
J. L. Wiley (*C. A.*)

38. Temperature measurements in melting and annealing furnaces in the alloy industry. F. Hoffmann. *Metall u. Erz*, **18**, 489–95(1921).—Temp. measurements on melting furnaces are in general without value as well as impracticable to be made. For annealing furnace recording thermocouples are practical and valuable, provided they are properly placed. R. S. Dean (*C. A.*)

39. Coal saving in gas works. Anon. *Gas World*, **75**, 430(1921).—The use of the *W. R. CO_2 Indicator* is discussed. (Cf. Ringrose, *These Abs.*, **1**, 4(1922).)
J. L. Wiley (*C. A.*)

PATENTS

40. Apparatus for effecting circulation and maintaining clean surfaces in stills. A. D. Smith. U. S. P. 1,403,980, 17.1.22. Appl., 13.9.19. Means are provided for circulating the liquid longitudinally, and for sweeping the bottom portion of the still crosswise, the sweeping device being caused to oscillate backwards and forwards in the liquid space of the still. A. R. M. (*J. Chem. Ind.*)

41. Boiler applicable for use as absorber in absorption refrigerating machines. W. Pfleiderer. G. P. 343,938, 4.4.15. Two vessels are disposed one above the other, and liquid is forced from the lower into the upper, so that only very little can remain in the lower vessel below the bottom of the tube connecting the two. Loss of liquid due to evapn. of liquid constantly draining from the upper to the lower vessel is thereby compensated. The rate of gas production is appreciably increased, and absorption of gas effected more rapidly, as the gas returning from the lower vessel passes through the absorbing fluid therein and in the upper vessel, in the form of bubbles.
J. S. G. T. (*J. Chem. Ind.*)

42. Electric furnace. W. Lohrey. U. S. 1,396,374, Nov. 8. The furnace comprises a mixing crucible within which metals such as Zn, Al, or Cu and Mg supplied from other crucibles within the furnace may be combined. (*C. A.*)

43. Electric rotating furnace. C. E. Cornelius. U. S. 1,396,677, Nov. 8. The furnace is adapted for melting powdered metallic substances such as Zn which are continuously introduced. (*C. A.*)

44. Die for making articles of plastic material. Andrew W. Gates. U. S. 1,393,014, Oct. 11, 1921. A mold for forming earthenware articles, comprising outer and inner die members shaped to form articles having cylindrical and conical portions and means for rotating one of the members and forcing it longitudinally with respect to the other member. C. M. S., Jr.

Chemistry, Physics and Geology

45. What happens under a pressure of 300,000 lb. per sq. in. Anon. *Eng. Min. J.*, **112**, 14.—Extracts from P. W. Bridgman's report in "Compressed Air." S. L. G.

46. The Euboean magnesite field. Harry C. Boydell. *Eng. Min. J.*, **112**, 771–3.—These deposits lie about 120 km. north from Athens, in serpentine in Cretacic limestones. Magnesite occurs as replacements along fault and joint fissures, in irregular lenses up to 130 ft. wide and 1800 ft. long, and of undetermined depth. The magnesite is dense cryptocrystalline and usually white. Some deposits are calcareous but the shipping ore is guaranteed 94% M_9CO_3. Much of the product averages higher. Miners (native) receive 65–70 cts. per day. Ore is hand-picked by women. Part is shipped raw, part, "caustic burned" (to 800°C), part, "dead burned" (to 1500°C). Greek, British and Dutch interests operate mines and furnaces. The product is all exported. S. L. G.

47. The Callville Wash colemanite deposit. HOYT S. GALE. *Eng. Min. J.*, **112,** 524–30.—A new deposit found in Jan., 1921, in S. E. Nevada (Clark Co.). Deposit seems to be of thermal spring origin and is in the nature of a large lens, in Tertiary rocks. Estimated 400,000 tons crude colemanite averaging 20% B_2O_3 or better. S. L. G.

48. Converting dolomite into magnesite. DJEVAD EYOUB. *Eng. Min. J.*, **112,** 771–6.—*Experimental.* Dolomites low in silica were calcined and leached. ($Ca(OH)_2$ said to be about 15 times as soluble in H_2O as Mg $(OH)_2$.) From 950° to 1000°F. (C ? abs.) found to be best temperature for calcination. Residue after leaching found in several cases, to compare very favorably with market material. S. L. G.

49. Non-metallics and enameled ware—"Consultation." *Eng. Min. J.*, **112,** 936.—Mentions minerals used in enameling iron, and gives ingredients for one ground, and one finishing coat. S. L. G.

50. Beutonite, its production and uses—"Consultation." *Eng. Min. J.*, **112,** 819.—Condensed statement based on Ladoo's pamphlet (U. S. Bureau Mines). S. L. G.

51. Manifold uses of quartz—"Consultation." *Eng. Min. J.*, **112,** 101. Summarized statement prepared from *Min. Res.* of U. S. Geol. Survey. S. L. G.

52. Geology of the Isle of Wight. H. J. OSBORNE WHITE. *Memoirs of the Geological Survey, England and Wales,* **1921,** 201–202.—Gives a brief review of source of brick and tile material to be found on this island. L. H. COLE

53. Mineral production of India 1914–1918. H. H. HAYDEN AND OTHERS. *Geological Survey of India,* **LII,** 1921.—This report gives resumés of the mineral production of India. Among the materials mentioned of interest to the ceramic industry are clays, cobalt, chromite, graphite, bauxite, borax and monazite. L. H. COLE

54. Economic minerals of Idar State, India. C. S. MIDDLEMISS. *Geol. Surv. India,* XLIV, **1,** 145–50(1921).—The writer in summing up economic possibilities of this State, mentions the occurrence of ordinary brick clays as well as the kaolin of Eklara and other places which may be of future value. Among other minerals of interest referred to are asbestos, chromite, magnesite, dolomite, talc and steatite. L. H. COLE

55. Graphite—Recent developments in the Buckingham District, Que., Canada. V. L. EARDLEY-WILMOT. *Bull. Can. Inst. of Mining and Met.,* **1921,** 539–555.—This paper gives a brief review of the occurrence and origin of graphite in Canada, as well as a thorough discussion of the mining and milling methods in present practice. Graphite products and uses are dealt with at length, the more important ones being crucible flake, lubricating uses, stove polish, foundry facings, etc. A description is given of the mill of the Quebec Graphite Co., at Buckingham, Que. L. H. COLE

56. A note on colloidal selenium. A. GUTBIER AND R. EMSLANDER. *Ber.*, **54B,** 1974–8(1921).—It was noticed that the presence of electrolytes had an important influence on the coagulation of colloidal Se by freezing. Since the solns. used contained H_2SeO_3 a way was sought to *prepare colloidal Se entirely free from electrolytes.* This was done by pouring hydrazine hydrate over SeO_2. The reaction is vigorous, sometimes producing flame. The mixt. should be cooled to prevent loss by evapn. When the SeO_2 settles out a blue-red soln. remains. Diffusion expts. with gelatin gel show it to be a true mol. soln. When put into much water it becomes a red colloidal suspension. Hydrazine hydrate also dissolves the gray Se at ordinary temp. A gas contg. H_2, N_2 and NH_3 is evolved, and a soln. which changes in color from brown to deep red forms. It also produces colloidal Se when put in a large excess of water. When dil., these colloids are stable for a week, become streaked on standing but uniform again on stirring. They endure boiling and can be freed from nearly all of the N_2H_4 in a Graham dialyzer or by means of parchment paper. $BaSO_4$ ppts. the colloidal Se completely. The stability of the colloid is a function of the degree of dispersion as is shown by the fact that a sample was completely coagulated in 3 days while all weaker concns. required

longer time for pptn. The original colors of the colloids indicated that the more dil. the Se the higher was the dispersion. To test the effect of electrolytes at ordinary temps. 0.0845 g. of gray Se in 1 cc. of hydrazine hydrate was poured into 1 l. of water and dialyzed for 6 days. Solns. of electrolytes 2 *N* in concn. added to equal vols. of this colloid, acted as shown below. On the addn. of HCl, HNO_3, H_2SO_4, H_2SeO_3 and CH_3CO_2H, the yellow colloid became successively red, violet and blue. This indicates a growth in the size of particles. NH_3 had no effect. NaOH made the color brighter and $Ba(OH)_2$ completely pptd. it. When frozen, coagulation was complete and irreversible. The addition of such substances as HCl up to 0.003 *N*, Na_2CO_3 up to 0.013–0.052*N* and KCl up to 0.05 *N*, stabilized the colloid when there was 0.110 g. of Se per 1. and prevented coagulation by freezing. Higher concns. of these salts are efficient coagulants of the same colloid. F. E. Brown (*C. A.*)

57. Organogels of silicic acid. B. S. Neuhausen and W. A. Patrick. *J. Am. Chem. Soc.*, **43**, 1844–6(1921).—Graham's statement that one liquid will entirely replace another in silica gels is not entirely true. Silica hydrogels retain as much as 4.8% of water when heated to 300° in vacuum for 6 hrs. Soaking in other liquids does not remove the last small portion of water. High temps. drive out the last traces of water without affecting the structure of the gel appreciably. The last portion of water is held by a force greater than that between the atoms of many stable compds.

F. E. B. (*C. A.*)

58. Heat of wetting of silica gel. W. A. Patrick and F. V. Grimm. *J. Am. Chem. Soc.*, **43**, 2144–50(1921).—Careful measurements of the heat of wetting of silica gels were made in an adiabatic calorimeter at 25°. The averages of the observed values in cals. per g. were, for water, 19.22; for C_2H_5OH, 22.63; for C_6H_6, 11.13; for CCl_4, 8.42; for $C_6H_5NH_2$, 17.54. It was detd. that the heat of wetting between 0° and 4° was positive. If the d. of silica gel is assumed to be 2 and the particles 5 $\mu\mu$ in diam. these heat effects could be explained by surface energy. F. E. Brown (*C. A.*)

59. Water of Borax Lake. Roger C. Wells. *J. Wash. Acad. Sci.*, **11**, 477–81 (1921).—Analyses in 1863, 1887 and 1921 indicated that the proportions of the salts present have changed since 1863. "In order to represent the dissolved alk. matter in the form of the customary buffer salts, as has been done for Searles brine, an artificial water, contg. 18.5 g. NaCl, 0.5 $MgCl_2$, 1.0 KCl, and 0.03 $CaSO_4$ per l., was made up as a medium to which buffer salts could be added and resulting *pH* values detd. A set of *pH* detns. was then made with various proportions of Na_2CO_3 and $NaHCO_3$; the total CO_2 was kept equal to that found in the lake water. Another similar set was made with mixts. of borax and $Na_2B_2O_4$; the total B_2O_3 was kept the same as found in the lake water." The results are tabulated and shown by curves. The *pH* value of the water was 9.75. To yield this figure the salts should be distributed in g. per l. as follows: Na_2CO_3 5.9, $NaHCO_3$ 3.5, $Na_2B_2O_4$ 2.17, $Na_2B_4O_7$ 0.68. These findings are compared with those of Searles Lake brine in which *pH* = 9.48. The gram ions per l. of Borax Lake are 31.58, those of Searles Lake 444.5. L. W. Riggs (*C. A.*)

60. Suggestions for the standardization of geological sections of strata proved in boreholes, shafts, etc. H. Roscoe. *Colliery Guardian*, **122**, 1140–2(1921).—A standard comprehensive section of strata met with in coal, Fe and fire-clay mining is lacking. A list of conventional signs and colors which could be understood universally is suggested. C. C. Davis (*C. A.*)

61. A new method for determining silicic acid. Travers. *Compt. rend.*, **173**, 714–7(1921).—By treating a slightly acid soln. of an alkali silicate with KF in the presence of considerable K salt, the Si can be pptd. completely as K_2SiF_6 which can be titrated with alkali hydroxide in accordance with the following equations: $SiO_3^{--} + 6H^+ + 2K^+ + 6F^- \rightarrow K_2SiF_6 + 3H_2O$ and $K_2SiF_6 + 4OH^- \rightarrow H_2SiO_3 + H_2O + 2K^+ +$

$6F^-$. Treat the soln. of alkali silicate in a Ag dish with at least 1 g. of KF for each 0.15 g. of SiO_2 present. Add HCl until the soln. is neutral to methyl orange and about 2 cc. in excess; then introduce 10 g. of KCl for each 40 cc. of soln. Filter the soln. using a hardened filter and an ebonite funnel. Wash the ppt. with 20% KCl soln., or with 50% alc. until the filtrate is no longer acid to methyl orange and then titrate the moist ppt. with 0.2*N* KOH, using methyl orange as indicator. The results obtained by this method are a little higher than those obtained by the conventional method, *e. g.*, 0.1238 g. SiO_2 instead of 0.1230 g. It is applicable for the detn. of Si in the presence of F and to silicate rocks when decomposed by fusion with KOH in Ag crucibles.

W. T. H. (*C. A.*)

62. An improved iron-manganese separation. M. CARUS. *Chem.-Ztg.*, **45,** 1194 (1921).—In the usual basic acetate sept. of Fe^{+++} and Mn^{++} the first basic acetate ppt. is likely to contain a little quadrivalent Mn so that it is customary to dissolve the ppt. and repeat the basic acetate pptn. In as much as MnO_2 dissolves in dil. acid in the presence of H_2O_2 which does not at the same time reduce Fe^{+++}, it has been found possible to effect perfect sepns. of Fe^{+++} and Mn^{++} by a single basic acetate pptn. as a result of adding about 3 cc. of 3% H_2O_2 to the soln. just before introducing AcONa. The Fe ppt. should be washed with water contg. a little AcOH, some AcONa and a little H_2O_2.

W. T. H. (*C. A.*)

63. Molding sands: their origin and uses. A. SCOTT. *Colliery Guardian*, **122,** 1404–5(1921).—A general paper, including the physics and chemistry of such sands.

C. C. D. (*C. A.*)

64. Coagulation of colloids by electrolytes. H. D. MURRAY. *Chem. News*, **123,** 277–9(1921).—Work on the pptn. of colloids by added electrolytes is reviewed and references are given. The results of different investigators are not comparable because of lack of uniformity in treatment. Six facts seem to have an important bearing on the theory: (1) the sp. action of ions of opposite sign, (2) the greater effect of higher valency, (3) the modifying action of ions of same sign as the colloid, (4) the possible adsorption of equiv. quantities of ions, (5) a minimum necessary concn. of electrolyte, (6) the possible effect of an ion originally present. If work is to be comparable, 4 conditions are necessary; (1) uniform concn. of colloid, (2) quick and uniform mixt. of colloid with electrolyte, (3) uniform treatment after mixing and (4) uniform size of colloidal particles.

F. E. BROWN (*C. A.*)

65. Catalysis in the interaction of carbon with steam and with carbon dioxide. HUGH S. TAYLOR AND H. A. NEVILLE. *J. Am. Chem. Soc.*, **43,** 2055–71(1921).—Steam was passed over C at 490°, 525°, and 570° and the vol. and compn. of the gases evolved detd. both in the presence and absence of catalysts. The reaction is (*a*) $C + 2H_2O = CO_2 + 2H_2$. The amt. of CO in the emergent gases was hardly measurable. This reaction takes place in 2 steps (*b*) $C + H_2O = CO + H_2$ and (*c*) $CO + H_2O = CO_2 + H_2$, of which (*c*) is the slower. Good catalysts for (*c*) such as iron oxide do not affect the velocity of (*a*) ; hence (*c*) reaches equil. under these conditions even in the absence of catalysts. Many substances of which K_2CO_3 is best are powerful catalysts for (*a*). The same substances are found to catalyze the reaction (*d*) $C + CO_2 = 2CO$. Adsorption measurements show that these catalysts increase the adsorption of CO_2 by charcoal. The results conform to the view that a surface complex C_xO_y is formed and the catalysts hasten the decompn. of this complex, thus cleaning off the surface for further adsorption of CO_2.

F. L. BROWNE (*C. A.*)

66. Diamond-drill sampling methods. R. D. LONGYEAR. *Trans. Am. Inst. Mining Met. Eng.*, **1921,** No. 1107-M, 7 pp.—A brief description of methods for collecting and preserving diamond-drill samples with emphasis on making the sample contain all the core obtainable and all of the cuttings.

C. E. CARLSON (*C. A.*)

67. Native antimony from Kern County, California. C. H. Behre, Jr. *Am. J. Sci.*, **2**, 330–3(1921).—The Sb from Kern Co. occurs as the core of nodules which are coated thinly with alteration products, (1) an unknown, black, Sb mineral, (2) yellow or white valentinite (?), (3) light stibiconite, and (4) a probable intermediate between (2) and (3). Edw. F. Holden (*C. A.*)

68. Thunder Bay District, Ontario. T. L. Tanton. Can. Dept. Mines, *Summary Report*, **1920**, Part D, 1–2.—Small but rich deposits of Ag ore on Silver Islet and vicinity were reopened in 1920, galenite and sphalerite being found. **Nipigon-Schreiber District, Ontario.** *Ibid.*, 2–7.—Mining claims were staked in this district as early as 1846. In this and subsequent years Zn, Pb, Cu, Ag, Au ores and anthraxolite were discovered, the Zenith mine being one of the earliest producing Zn mines in Can. At present the mining interests are connected with the Au deposits, and search for Ni in pyrrhotite. Anthraxolite was found on the C. P. Ry. 1 mi. west of Rossport; it is high in C and resembles anthracite, but is regarded as an altered liquid bitumen. **Oil possibilities of Manitoulin Island.** M. Y. Williams. *Ibid.*, 26–33.—An oil spring was discovered about 1650. Some drilling was done. The results of recent work prove that oil is not present in com. quantities. Logs of 5 wells are given. Analyses of 3 samples of oil gave 54, 48 and 46%, resp., of distillate below 350°. Oil shale of this region contained 65% ash and 35 volatile matter. B. t. u. per lb. 1720, oil yield per ton 7.7 U. S. gal., gas yield 740 cu. ft. per ton. B. t. u. of gas 540 per cu. ft. **Mesozoic clays and sands in Northern Ontario.** J. Keele. *Ibid.*, 35–9.—Washed cretaceous sand along the banks of the Missanaibi river contained SiO_2 97.72% and Fe_2O_3 0.32. The best clay deposit along the river contained SiO_2 53.10%, Al_2O_3 31.92, Fe_2O_3 1.52, H_2O 12.35, and was exceptionally high-grade as regards refractoriness. **Fluorspar deposits of Madoc District, Ontario.** M. E. Wilson. *Ibid.*, 41–78.—An av. of 16 shipments contained CaF_2 76.61%, $BaSO_4$ 8.13, $CaCO_3$ 9.11, (Al_2O_3, Fe_2O_3) 3.07, SiO_2 2.74. Along with CaF_2 in the fluorspar veins, in the order of their abundance are: barite, calcite, celestite, quartz, marcasite, pyrite, chalcopyrite, tetrahedrite, malachite, and elaterite. **Brockville-Mallorytown Map-area, Ontario.** J. F. Wright. *Ibid.*, 78–84.—Ore shipped analyzed 68% Fe, being either a hard, massive red hematite, or a sandstone impregnated with hematite. "No large body of ore will ever be found." L. W. Riggs (*C. A.*)

69. The theory of flotation. I. Traube. *Metall u. Erz*, **18**, 405(1921).—The flotation problem is a problem of colloid science. The ore pulp is a suspension. The particles in suspension sink under the action of gravity according to Stokes law, *i. e.*, the velocity of settling is proportional to the wt., the square of the radius of the particles and the difference between the sp. gr. of mineral and water, and inversely proportional to the viscosity of the water. To det. the action of other substances on the settling rate of the suspended particles the elec. charge of colloid particles must be considered. Most colloids are negative, including the gang minerals and according to Zsigmondy also the sulfides; however, according to Callow, Wageler and Zimmersbach the metal sulfides are positively charged and the flotation phenomenon is due to the attraction of the negatively charged oil drops by the sulfide particles. Ryschkewitsch's observations, however, do not support this latter view. The hydroxides of Fe and Al are electropositive, the fatty acids as well as aniline bases are negative and quinoline is positive. In general, sedimentation is increased by a colloid of opposite sign and decreased by one of the same sign. The same is true of the addition of ions. Negative suspensions are stabilized by the addition of alkali. The rate of settling is also lowered by the addition of colloids which increase the viscosity of water. The flotation process consists in a reversal of the settling process for some particles but not for others. This depends on the adsorption of the flotation agent on the ore minerals. In this connection the suggestion of Ryschkewitsch that the difference in adsorptive power of

gang and ore minerals is due to the fact that the gang materials have a mol. crystal lattice while the ore minerals have an ion crystal lattice is interesting. This adsorbed material lowers the interfacial tension. The amt. of this adsorption is notably affected by other acids and alkalies, the increase in adsorption of a fatty acid on galena by the addition of H_2SO_4 being particularly large. No adsorption by chalcopyrite could be detected by the stalagmometer in the case of cresol, amyl alc. and xylidine, but the ultramicroscope shows that an adsorption takes place. The particles with adsorbed flotation agent are adsorbed at the oil-water interface and thus become a part of the froth, the formation of which depends on the lowering of the surface tension of the water by the flotation agent owing to the absorption of the latter. R. S. DEAN (*C. A.*)

70. Comments on various methods of attacking mineral ochers. A. RAYNAUD. *Bull. soc. chim.*, **29**, 905–10(1921).—A rapid proximate analysis of ochers may be made as follows: Dry the finely powd. sample at 105° and then heat over the burner to const. wt. This gives the moisture, hygroscopic and combined. Treat the anhyd. powder with HF and H_2SO_4 and, after evapg. to dryness, call the loss in wt. SiO_2. Fuse with $K_2S_2O_7$, take up in hot water and reduce the Fe with metallic Zn. Titrate with $KMnO_4$ and thus get the Fe_2O_3. Subtract the % of H_2O and Fe_2O_3 from 100 and call the difference Al_2O_3. W. T. H. (*C. A.*)

71. Formation and constitution of kaolin. V. J. BERNAOLA. *Anal. soc. quim. Argentina*, **8**, 392–400(1920).—A theoretical discussion of the mode of formation of kaolin and the supposed occurrence of cryst. particles associated with it. Assuming kaolin to be formed by the removal of Na, K, or Ca silicates from feldspars by soln., the formation of crystals is excluded and the cryst. forms observed are merely pseudomorphs after feldspars. The porous character of kaolin particles implied by its origin as a metasomatic product from feldspars would account for the plastic properties of clays. J. C. S. (*C. A.*)

72. The colloidal character of clay from the practical point of view. A. BENCKE. *China Clay Trade Rev.*, **3**, 188–9(1921).—A good review. C. H. K. (*C. A.*)

73. The flotation of sulfide ores in the laboratory. W. GROSS. *Metall u. Erz*, **18**, 483–6(1921).—The greatest difficulty with lab. tests is to get comparable grinding conditions. Closed ball mills give too much fine material; the best results are obtained with ball mills with sieves. The amt. of ore used is 5–1500 kg. and the necessary small amt. of flotation agent is added from a buret. For testing machines miniature Janny machines are obtainable and compressed air machines as the Grondal or Callow may be improvised. R. S. DEAN (*C. A.*)

74. The recently developed magnesite deposits in the Galgenberge, near Zobten, Silesia. L. VON ZUR MÜHLEN. *Z. prakt. Geol.*, **28**, 155–8(1920).—Compact magnesite occurs in veins in serpentine; it was probably deposited as a colloid from waters which had dissolved the Mg compds. from the upper portions of the serpentine, enriching the deeper part of the rock, and leaving a residual mass of Ni, Fe, and silica minerals. The magnesite later became finely cryst. EDW. F. HOLDEN (*C. A.*)

75. The bauxite deposits of the Vogelsberges. H. HARRASSOWITZ. *Metall u. Erz*, **18**, 557–77(1921).—The bauxite is a secondary deposit which was removed from its place of formation by ground waters and laid down in the Pliocene basin. Its first formation resulted from kaolinization of basalt, probably connected with climatic conditions. R. S. DEAN (*C. A.*)

76. Chromite in northern Macedonia. C. HÜTTER. *Z. prakt. Geol.*, **28**, 53–9 (1920).—Chromite is found at several places near Raduscha, in lenses in a serpentine carrying microscopic grains. The ore was probably concd. through magmatic differentiation in a periodotite, which later altered to serpentine; it carries 40–50% Cr_2O_3. E. F. H. (*C. A.*)

77. Manganese and manganiferous ores in 1920. H. A. C. JENISON. U. S. Geol. Survey, *Mineral Resources of U. S., 1920*, Pt. I, 271–83(preprint publ. Dec. 27, 1921). E. J. C. (*C. A.*)

PATENTS

78. Zinc oxide. NEW JERSEY ZINC CO. Brit. 165,767, Jan. 14, 1921. In the production of ZnO by volatilizing Zn in a retort and burning the vapor, a considerable body of molten Zn is returned in the retort, and solid Zn is added from time to time in comparatively small quantities, the operation being practically continuous. A suitable construction is specified. Cf. *C. A.* **15,** 2531. (*C. A.*)

79. Purifying bauxite. E. EVERHART. U. S. 1,397,414, Nov. 15. Bauxite ores contaminated with clay are disintegrated, agitated in a clay-deflocculating liquid such as dil. NaOH soln. until the clay substances are suspended and the suspended material is sepd. from the granular bauxite. (*C. A.*)

Refractories and Furnaces

80. The hardness of refractories at high temperatures. E. RENGADE AND E. DESVIGNESS. *Céramique*, **25,** 33–37(1922).—The hardness of various silica-alumina

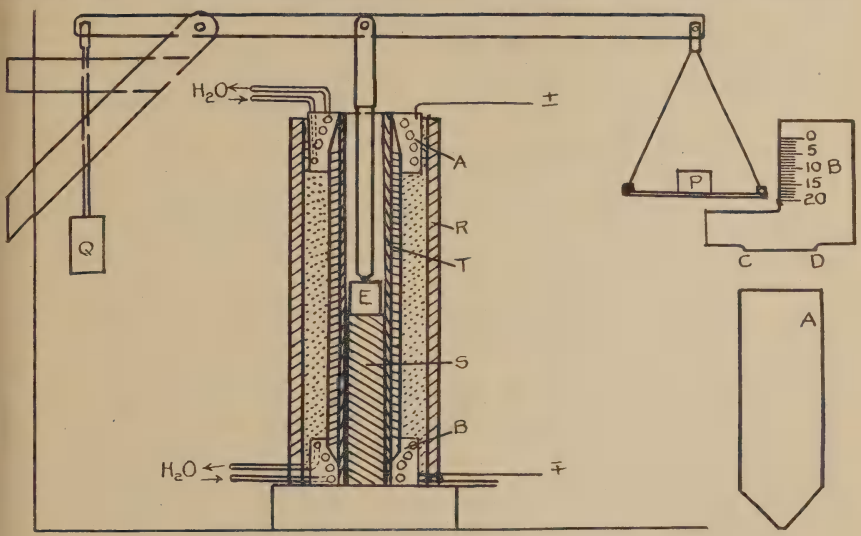

FIG. 1.

refractories were tested by heating small cubes of the material to high temps. in a carbon resistance furnace and forcing a cone-shaped graphite rod into the test piece with a load of 10 kgs. See Fig. 1. The cylinder of graphite has a diam. of 50–60 mm. with a 90° cone. The load is applied for 10 mins. and the impression thus made is measured. The temps. were obtained with an optical pyrometer. The results of the tests are shown in Fig. 2. The chem. analyses of the refractories are as follows:

	1	2	3	4	5	6	7	8	9
Loss on ignit.	0.20	0.15	0.20	0.54	0.40	0.20	0.25	0.25	0.22
SiO	70.90	85.20	80.80	72.70	71.60	70.62	57.80	67.20	26.80
Al_2O_3	23.60	11.30	14.72	20.00	21.00	25.80	37.50	29.07	61.70
CaO	0.35	0.20	0.45	0.20	1.15	0.80	0.60	0.90	1.30

	1	2	3	4	5	6	7	8	9
MgO	0.15	0.14	..	0.30	0.20	..	0.33	0.18	0.07
K_2O	1.30	0.91	1.90	1.00	0.18	tr.	tr.	..	..
Na_2O	..	..	..	0.45	0.18	tr.	tr.	..	..
Fe_2O_3	2.03	1.27	1.44	4.38	4.29	1.98	3.73	2.34	6.66
TiO_2	1.52	1.10	0.69	0.88	1.28	0.88	..	..	3.44
Fusion temp.. °C.	1670°	1680°	1690°	1550°	1630°	1690°	..	..	1730°

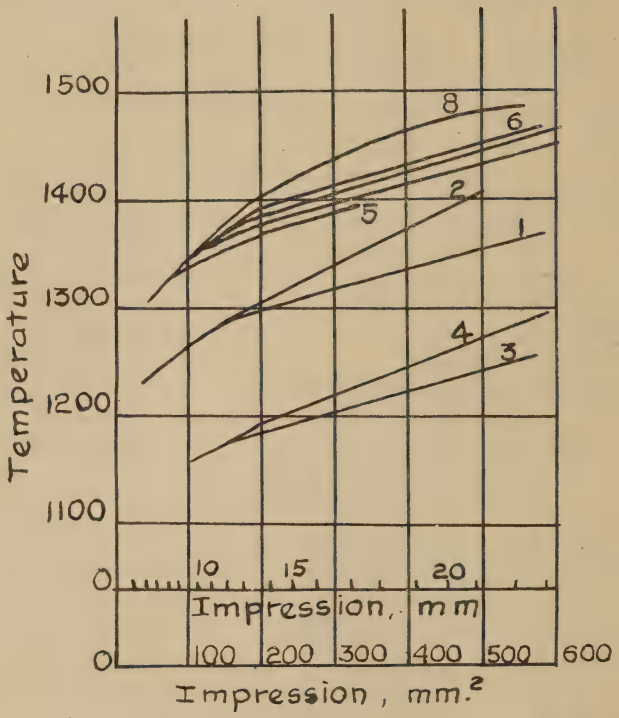

FIG. 2. H. G. SCHURECHT

81. Report on refractory materials. W. H. FULWEILER. *Gas Age-Record,* **48,** 653–4(1921).—Progress report of the Comm. on Refractories of the Am. Gas Assoc. For water-gas machine linings chromite, mica schist, and SiC have thus far proved unsatisfactory; zirkite and sillimanite are under observation. J. L. WILEY (*C. A.*)

82. The operation of basic electric furnaces. M. W. CARUTHERS. *Iron Age,* **109,** 17–9(1922).—C. discusses at length the 8 major operations of making steel in funaces having movable electrodes. C. G. F. (*C. A.*)

83. Industrial gas and industrial furnaces. E. W. SMITH. *Gas J.,* **156,** 816–20 (1921).—S. discusses the industrial application of gas with especial emphasis on *surface combustion.* J. L. WILEY (*C. A.*)

84. Surface combustion. H. LININGER. *Z. Ver. Gas-Wasserfach,* **61,** 117–22 (1921).—L. describes the principles, the advantages, the applications and the app. therefor of the surface combustion method of heating as developed by the Surface Combustion Co. of N. Y. J. L. WILEY (*C. A.*)

85. Comparative calculations on the subject of producer gas in case steamis added to the blow air. J. SEIGEL. *Rev. metal.*, **18,** 608–18(1921); cf. *Jour. Am. Ceram. Soc.*, **4,** 1008.—Mathematical and graphical calcns. on the variations in calorific power per m.^{3} of gas, in calorific power per vol. of gas obtained from 1 kg. of fuel, and in the temp. of combustion, when the content in H varies. If different producer gases possess the same potential heat per kg. of fuel, the calorific powers per cu. m. and the temps. of combustion can be diminished only by raising the content in H of the gas. There is no advantage to be expected by injecting steam into the producer either in connection with the yield of potential heat units or in the quality of the gas (the calorific power per m.^{3} and the temp. of combustion). The real advantage is obtained in decreasing the amt. of clinker formed and in avoiding fuel losses in the clinker; beyond that point the addition of steam is detrimental. J. L. WILEY (*C. A.*)

86. Moore gas producing system. ANON. *Gas World*, **75,** 451(1921); fig.—In the Moore system, water gas and coal gas are produced in the same app., which comprises a generator having a vertical retort, of smaller cross-sectional area, in its upper part surrounded by a checkered chamber, primary and secondary air blasts being employed, the latter being utilized to burn the gases from the blow in the checkered chamber, the whole being enclosed in a surrounding shell and the fuel being supplied from the top through a coal valve. Both the feed of coal and extn. of the coke are performed without disturbing the gas-making process. About 35,000 cu. ft. of 425–450 B. t. u. town's gas are produced per ton of coal. The plant can be adjusted for partial or complete gasification. Tar and available NH_3 content of the coal are recoverable. A 500,000 cu. ft. per day plant is to be built at Scunthorpe, Eng. J. L. WILEY (*C. A.*)

87. The use of automatic stokers for high-temperature metal-heating furnaces. F. VERDEAUX. *Technique moderne*, **13,** 414–7(1921).—The consumption of slack coal (6,600 cal.) per sq. m. of radiating surface (taken equal to the surface of the arch over the grate and extending to the bridge) is given by $C = 3(T_0 + T)/(T_0 - T)$, where C is the consumption, T the temp. at the bridge, and T_0 is 1450° when dry air is blown through the grate and 1400° when steam is used. T is generally 100–50° higher than t, the working temp. A large decrease in output corresponds to a relatively small decrease in coal consumption, owing to the very high temp. Therefore close supervision is required for even automatic stokers. A. PAPINEAU-COUTURE (*C. A.*)

88. Investigation of refractory materials: the after-contraction test. D. A. JONES. *Gas World*, **75,** 422(1921); *Gas. J*, **156,** 498–9(1921).—Preliminary report from the Inst. of Gas Engineers' Refractory Materials Comm. Whole bricks, not small pieces, are used. The bricks are heated in a surface combustion furnace, the heat being raised for 4 hr. and maintained at the max. temp. (cone 14 for fire brick and cone 12 for silica brick) for 2 hr. Considerable diversity is shown in the readings on account of the unevenness of the surfaces and the dislocation of the surfaces after firing. Marks should be made on the brick, and the variation between these measured by reading microscopes. J. L. WILEY (*C. A.*)

89. Reversible thermal expansion of silica. H. S. HOULDSWORTH AND J. W. COBB. *Colliery Guardian*, **122,** 1003(1921).—On burning, the quartz first undergoes a permanent linear expansion, with little or no decrease in d., but an increase in porosity. Further burning to cone 14–16 alters the expansion curve, the quartz being more or less completely changed to crystobalite. A detn. of the true d. of the powdered brick is the best guide to its expansion behavior. C. C. DAVIS (*C. A.*)

90. Steel-works furnaces and gas producers. J. S. ATKINSON. *J. West Scotland Iron & Steel Inst.*, **29,** 4–14(1921).—A discussion of the design and operation of mechanical gas producers; of the Stein type of recuperative furnaces and soaking pits; and of American, British, and continental European open-hearth furnaces. Data are given

from comparative runs of similar producers with and without the Chapman floating agitator. The results were in favor of the use of the agitator. Gas-fired furnaces are regenerative, recuperative, or without either regeneration or recuperation. Each type has definite and limited applications. The principal causes of failure in faultily designed recuperators are discussed and the Stein recuperator is described in detail. In discussion J. Mitchell and R. P. Smith express doubt that agitation of the fuel bed of gas producers is an advantage in all cases. LOUIS JORDAN (*C. A.*)

91. Garrister, its production and uses. Consultation column. *Eng. Min. J.*, **112,** 537. Brief summary mainly from U. S. G. S. reports. S. L. G.

PATENTS

92. Zinc-smelting furnace. B. RAEDER. Can. 214,692, Dec. 13, 1921. An elec. furnace for Zn production has a chamber heated with energy supplied through C electrodes, a superposed chamber for drying and glowing heated by the combustion of gas and a drying compartment above the latter chamber. The charge is fed successively through the 3 compartments. (*C. A.*)

93. Basic refractory brick. S. B. NEWBERRY. U. S. 1,400,087, Dec. 13. A mixt. of lime 2.10 and argillaceous material 3.35 parts is calcined, the proportions of the resulting materials being such that the clinker formed will not disintegrate after prolonged heating or exposure to the air. A mixt. of lime and clay or the like of greater fusibility is added to the clinker and the mixt. is molded and burned as usual in making fire brick. (*C. A.*)

94. Perforated arch and brick therefor. ALFRED H. WILLETT. U. S. 1,395,542 Nov. 1, 1921. In an arch construction for fire boxes provided with supporting tubes, the combination of a plurality of reversible fire bricks adapted to be supported in rows upon the tubes, each of the fire bricks being narrower at one end than at the other so that if the bricks in a row be assembled with narrow and wide ends alternating in the adjacent bricks an imperforate arch will be formed, but if assembled with all wide and all narrow ends together, a perforate arch will be formed. C. M. S., JR.

Art

95. Coloring doll heads. ANON. **53,** 486–487(1922).—A new process for coloring doll heads is described. The body must have a high feldspar content, 30%, since high silica bodies become violet. The compn. of the bodies are as follows:

	CASTING BODY		
Norwegian feldspar	31.52	Norwegian feldspar	31.54
Lime feldspar	3.05	Whiting	3.05
Zettlitzer kaolin	52.87	Zettlitzer kaolin	51.45
Quartz	12.56	Löthainer clay	2.00
	100.00	Quartz	12.00
Soda	0.2		100.04
Water	79.0		

14% of a mixt. composed of 100% $Al(OH)_3$ and 30% $MnSO_4$ dissolved in water is added to the body given above. The mixt. is heated to Seger cone 02*a* in a muffle kiln. The calcine which is now a rose color is then treated with 10% $(NH_4)_3PO_4$ dissolved in water. It is then boiled with 8% H_2SO_4 soln. and after drying and grinding is ready for use. The firing should be done in a strictly oxidizing furnace atmosphere, since the iron compounds cause a yellow coloring when not reduced. This yellow together with the Mn rose produces the flesh color. The color is painted on the doll heads by artists and is then fired at low temps. H. G. SCHURECHT

96. Production of iridescent effects (interference phenomena) for the manufacture of imitation mother of pearl. F. J. G. VILLFORTH. *Kunststoffe*, **11**, 153–5, 162–4 (1921).—Review of patent literature. C. J. WEST (*C. A.*)

Abrasives

PATENTS

97. Abrasive. W. MARTINOFF. Brit. 166,713, April 21, 1920. Clay free from arenaceous quartz is heated to 1500–1800° until it becomes grey or black, according to the color of clay used. The material is ground and used as a substitute for emery in abrasive wheels. (*C. A.*)

98. Grinding compounds. W. P. THOMPSON. Brit. 169,868, July 27, 1920. An abrasive compd. used with H_2O for metal work consists of powd. carborundum distributed in a jelly of water and starch, flour, or other water-sol. glutinous binder. (*C. A.*)

Heavy Clay Products

PATENTS

99. Drain-tile. EMORY E. TROWBRIDGE. U. S. 1,393,329, Oct. 11, 1921. In drain tiles the combination with a pair of abutting tubular members, of an enlarged flange portion secured to the end of one tile member and fitting around the abutting end of the other tile, a cup shaped portion carried by the flange and adapted to collect the moisture from the subsoil and permit the seepage through the tiles into the system. C. M. S., JR.

100. Hollow tile. JACOB VOORHIS CLOSE. U. S. 1,395,176, Oct. 25, 1921. A building tile having a plurality of differently shaped vertical openings, sundry of the openings having one end wall recessed, the opening at one end of the tile having its outer end wall provided with wire cuts to permit its removal to form a recess at the end of the tile, the side walls of the openings having a recessed end wall being provided with wire cuts, whereby a number of differently shaped units can be formed from the tile, each having a recess in one end. C. M. S., JR.

101. Brick. JAMES ALEXANDER PAPOT. U. S. 1,394,759, Oct. 25, 1921. In a wall construction, bricks arranged to provide opposed stretcher rows, alternate built-up sections disposed between the stretcher rows, one of the sections including bricks laid on their side faces and having their adjacent edges disposed in spaced relation to provide a passageway, the adjacent section including bricks laid on their side faces, and bricks positioned on upper side faces of the latter bricks. C. M. S., JR.

102. Roofing-tile. RICHARD JOSEPH. U. S. 1,395,423. Nov. 1, 1921. In a roofing tile, a body of plastic material, a transverse rib arranged to engage the roofing strip and a hooked member slidably mounted through the rib and arranged to engage the roofing strip. C. M. S., JR.

103. Manufacture of bricks. WALTER WILLIAM CRAWFORD. England 1,395,990, Nov. 1, 1921. The method of mfg. bricks and the like, which comprises burning suitable gangue in an oxidizing atmosphere, then mixing the burned material with a relatively small quantity of dehydrated cement, then moistening the mixture and pressing the same into form, then immersing the pressed form in cold water, and finally drying the pressed bricks at a low temp. C. M. S., JR.

104. Arch-protector for clamp-kilns. FREDERICK GLECKLER. U. S. 1,396,189, Nov. 8, 1921. In a kiln of this class, the combination with a ware arch extending from a furnace opening in the kiln wall, of loosely positioned brick forming a sub-arch or tun-

nel within the ware arch from the furnace, with the spaces between the bricks forming lateral distributing openings for the flame and hot gases of combustion from the sub-arch and into the ware arch. C. M. S., Jr.

105. Brick-cleaning machine. Edward L. Minor. U. S. 1,397,227, Nov. 15, 1921. A rotatable rack having a concentric series of axial supports with floating metallic disks mounted thereon, and a bed above which the peripheries of the rotating disks will project to engage an article thereon to be cleaned. C. M. S., Jr.

106. Paving-brick. Frank B. Dunn. U. S. 1,397,505, Nov. 22, 1921. As an article of manuf. an unpressed paving brick cut from a continuous column of clay having two transverse grooves in one of the die-formed surfaces thereof, and perimetrical studs projecting from the surface of the die-formed surface adjacent to the same relative side of each of the transverse grooves. C. M. S., Jr.

See Abs. 120.

Glass

107. Effect of sulphate and carbonate of sodium on the heats of fusion of soda-lime glass batches. Emille Fourcault. *Le Verre*, 251–54(1921); 6–9(1922).—A glass 75.3% SiO_2, 12.9% Na_2O, 11.8% CaO, *i. e.*, $Na_2O.CaO.6SiO_2$ is taken for an example. The sp. ht. of the glass is calcd. by the law of Woestyn where $C = \frac{a_1}{100} \times e_1 + \frac{a_2}{100} \times e_2 + \frac{a_n}{100} \times e_n$ in which C = sp. ht.; a = per cent compn. of oxide; e = corresponding constant. At 0° Co $= \frac{75.3}{100} \times 0.1913 + \frac{12.9}{100} \times 0.2674 + \frac{11.8}{100} \times 0.1903 = 0.20$. For a temp. $t°$ the sp. ht. is C_t = Co $(1 + \alpha t)$ where $\alpha = 0.00078$. For the mean sp. ht. between 0° and $t°$ C_{mt} = Co$(1 + \frac{\alpha t}{2})$. Values for the Co are SiO_2 0.1913, NaO_2 0.2674, Na_2CO_3 0.273, Na_2SO_4 0.231, CaO 0.1903, $CaCO_3$ 0.215; for C_{mt}, where $t°$ = 1500°, glass 0.317, Na_2CO_3 0.433, Na_2SO_4 0.366, $CaCO_3$ 0.341, SiO_2 0.302. The following factors are taken into consideration: (1) *The heat required to bring each constituent of the batch to 1500°.* This is calcd. from the C_{mt} data on a mol. wt. basis:

	A		B	
	Kgs.	Calories	Kgs.	Calories
Na_2CO_3	106	68,847	..	....
Na_2SO_4	..	....	142	77,958
$CaCO_3$	100	51,150	100	51,150
SiO_2	360	163,080	360	163,080
		− 283,077		− 292,188

Each batch (A or B) gives 478 Kgs. of glass. (2) *Heat absorbed during decompn.* To decompose 1 Kg. of Na_2CO_3 713.2 cal. per Kg. are required, for Na_2SO_4 952.8, for $CaCO_3$ 451.5 cal. For Batch A, 120,750 cal. are absorbed, and for B, 180,450 cal. (3) *Heat necessary to melt the new silicates formed, and also the excess silica.* The silicates formed will be Na_2SiO_3 0.26, $CaSiO_3$ 0.24, with excess SiO_2 0.50, as mol. per cent. The hts. of fusion are per Kg. Na_2SiO_3 30 cal., $CaSiO_3$ 27.3 cal., SiO_2 30 cal. For 478 Kgs. of glass 14,025 cal. are needed. (4) *Heat liberated by the formation of the silicates.* For Na_2SiO_3 65,000 cal. per Kg., and for $CaSiO_3$ 35,000 cal. per Kg. are liberated. The net results are:

	A	B
(1) Heating mixt. to 1500°	− 283,077 cal.	−292,188 cal.
(2) Decompn. of carbonate and sulphate	− 120,750 cal.	− 180,450 cal.
(3) Heat of fusion of silicates	− 14,025 cal.	− 14,025 cal.
(4) Heat of formation of silicates	+ 100,000 cal.	+ 100,000 cal.
Heat absorbed by 1 Kg. mole. of glass	− 317,852 cal.	− 386,663 cal.
Or by 1 Kg. of glass	− 665 cal.	− 808 cal.

Calcns. for 2 other glasses are given: Belgian blown glass, per cent compn. SiO_2 71,850, CaO 14,274, MgO 0.070, Al_2O_3 0.522, Fe_2O_3 0.290, Na_2O 12.944, mol. compn. 0.85 Na_2O, 1CaO, 4.55 SiO_2. Ht. absorbed per Kg. of glass, for carbonate 583 cal., for sulphate 736 cal., Belgian drawn glass, per cent compn. SiO_2 73.647, CaO 11.080, MgO 0.91, Al_2O_3 0.494, Fe_2O_3 0.303, Na_2O 14.385, corresponding to 1.19 Na_2O, 1CaO, 6.13 SiO_2. Ht. absorbed per Kg. of glass for carbonate 678 cal., for sulphate 842 cal. LOUIS NAVIAS

108. The relation between the density and composition of glasses. W. L. BAILLIE. *J. Soc. Chem. Ind.*, **40**, 141–48(1921).—See Abs. **55**, *These Abs.*, **1**, 19(1922). (*C. A.*)

109. The manufacture, properties, and employment of heat-intercepting structural glass. G. ALLEMAN. *J. Soc. Chem. Ind.*, **40**, 241–2T(1921).—The batch for this *actinic glass* as made by the Penna. Wire Glass Co. and expressed in lbs. is SiO_2 1300, Na_2CO_3 400, $Na_2B_4O_7$. $10H_2O$ 20, CaO 200, $NaNO_3$ 40, with decolorizers expressed in g. MnO_2 85, TiO_2 30, "nickel oxide" 35, and 40 lbs. of artificial biotite. The artificial biotite consists of micaceous hematite 40, pptd. Al_2O_3 5, "solid Na silicate" 50, magnesite 5, and MnO_2 30 g. Specimens of this glass $^1/_4$ in. thick transmit 42% of light, eliminating all glare and absorb 78% of heat. The transmission of the luminous rays by different forms of glass varies considerably: Plain polished plate 92.26% of transmission; plain polished wire 68.76%; plain aqueduct wire 40.88%; plain cobweb wire 46.98%; plain ribbed wire 41.96%; plain corrugated wire 44.45%; actinic polished plate 42.02%; actinic rough wire 39.74%; actinic aqueduct wire 21.48%; actinic ribbed wire 32.57%; actinic corrugated wire 29.88%. The transmitted light measured included only that which emanated perpendicularly from the face of the glass. The following figures show the amt. of illumination (due to reflection as well as transmission) in houses of various kinds of glass: Plain polished plate 94.3% of illumination; plain aqueduct wire 81.8%; plain ribbed wire 81.7%; plain corrugated wire 86.0%; actinic rough wire 72.7%; actinic aqueduct wire 47.2%; actinic ribbed wire 77.3%; actinic corrugated wire 77.0%. The wire glass is fire-proof and retains its strength when cracked being suitable roofing material. The glass also finds use in containers of chemicals sensitive to light and heat, and as windshields. It reduces glare in the latter case, and it is claimed is an improvement over ordinary plate glass in aiding the vision when the windshield is covered with raindrops. J. B. PATCH (*C. A.*)

PATENTS

110. Sheet-glass drawing machine. ROBERT P. CALLARD and CLARENCE A. RHONEMUS. U. S. 1,393,081, Oct. 11, 1921. In a continuous sheet glass drawing machine, the combination of a receptacle for molten glass having oppositely-disposed overflow portions, and sheet drawing and width maintaining means, comprising an endless series of edge molding devices movable vertically past each of the overflow portions, for forming the sheet edges and holding them laterally while simultaneously drawing the sheet upward. C. M. S., JR.

111. Manufacture of glass articles. ROBERT FREDERICK HALL. England 1,393,118. Oct. 11, 1921. A machine for the manuf. of glass articles comprising a supporting frame, an upper and a lower elongated endless carrier supported in the frame and parallel to each other, the carriers having their opposite faces in proximity to each other during a portion of the travel, means for concomitantly moving the carriers in opposite directions whereby the opposed faces move together throughout a portion of their travel, a series of molding devices on the lower carrier comprising parison and finishing molds, a series of upper mold sections on the upper carrier and adapted to coöperate with the finishing and parison molds, and automatic means for operating the parison molds and upper mold sections for forming glass articles during the portion of travel when the finishing and upper mold sections are moved together in opposed relation. C. M. S., JR.

112. Method and apparatus for drawing sheet-glass. JOSEPH E. CROWLEY. U. S. 1,394,283. Oct. 18, 1921. The process of mfg. sheet glass, comprising the simultaneous drawing of a plurality of sheets, passing the sheets about a bending roll in separable contact with each other, continuing the drawing in a plane while still in contact and finally separating the sheets. C. M. S., JR.

113. Machine for making hollow glass-ware. EDWARD S. HUTTON. U. S. 1,394,092. Oct. 18, 1921. A machine for making a hollow glass-ware, including a rotary table, a mold holding frame mounted in the table with guideways in the sides thereof, a blank mold, a blow mold, each of the molds being formed of two vertical halves, stationary means on the outer end of the frame for securing the two outer halves of the molds, a block movable in the frame for holding the two inner halves of the molds, a rod connected with the inner block for moving the inner halves of the molds for opening and closing the molds, the block being radially slidable, and stationary cams near the center of the machine for engaging the inner end of the rod and forcing it inwardly and outwardly. C. M. S., JR.

114. Glass composition and method of making same. ELBERT E. FISHER. U. S. 1,394,296. Oct. 18, 1921. A glass comprising more than 60% of silica, one or more oxids of the second periodic group having a thermal expansion of less than 4 as compared to silica, and not more than about 6% of alkali metal oxids of the first periodic group. C. M. S., JR.

115. Process of manufacture of a glass using natural silicates, such as micaceous minerals, asbestos, and the like. PERCY BROADBENT CROSSLEY. Calcutta, India. 1,394,973. Oct. 25, 1921. The method of manufacturing glass which comprises dissolving mica in molten glass and maintaining the temperature below that at which the mica effervesces. C. M. S., JR.

116. Glass roll. KENJI MATSUO. Tokyo, Japan. 1,394,684. Oct. 25, 1921. A roll consisting of a steel pipe the outer surface of which is perfectly smoothed and covered with a layer of milk glass which is rich in metallic constituents, substantially as and for the purposes herein before set forth. C. M. S., JR.

117. Process and apparatus for drawing sheet-glass. IRVING W. COLBURN. U. S. 1,394,809. Oct. 25, 1921. The method of forming sheet glass, consisting in providing a slab within a heated chamber and projecting the discharge end thereof into a temp. which is less than that of the chamber, and causing molten glass to flow onto the slab within the chamber and to be drawn from the discharge end thereof. C. M. S., JR.

118. Glass-discharging mechanism. EDWARD S. HUTTON. 1,394,677. U. S. Oct. 25, 1921. The combination of a glass tank, a glass discharge member extending through the wall thereof with its ends projecting beyond the wall, the member having a relatively large glass receiving chamber opening downward in the inner portion thereof and a glass conduit of relatively smaller dimensions in cross-section than the receiving chamber and which extends from the upper end of the receiving chamber at an upward inclination to the discharge end thereof, and means for causing a sudden rising of the glass in the outer portion of the conduit for causing the discharge therefrom of a gather of glass. C. M. S., JR.

119. Glass-delivery apparatus. RICHARD T. MCGEE. U. S. 1,394,920. Oct. 25 1921. Glass delivery app., comprising, in combination with a melting tank, a well located at a suitable distance from the tank, a passage for glass leading outward from the tank in the general direction of the well, a second passage located on a lower level than the first passage, the second passage being in open communication with the well and being adapted to receive glass by gravitation from the first passage and means for producing glass displacement within the second passage for ejecting glass from the mouth of the well. C. M. S., JR.

120. Manufacture of bricks. FRIEDRICH BRETTSCHNEIDER. Moravia 1,395,173. Oct. 25, 1921. The process for making bricks which consists in charging plastic material into a mold-frame closing the frame and applying pressure to cause the excess-charge to escape and to be cut off between the mold-frame and cover plates, the pressure being then maintained until the rest of the excess-charge resulting from the elasticity of the mass has escaped through apertures provided for this purpose.

C. M. S., JR.

See Heavy Clay Products.

121. Method of and apparatus for forming glass tubes. KARL KUPPERS. Germany 1,395,963. Nov. 1, 1921. A process for the production of reinforced glass tubes which comprises placing a skeleton body upon a suitable mandrel, then placing a glass tube upon the skeleton body and the mandrel, closing one end of the glass tube, evacuating the tube, sealing the other end of the tube, and heating the tube by means of a suitably heated ring-shaped member with relative movement of the tube in order to heat its entire surface whereby the glass passes through the interstices of the skeleton body and conforms to the shape of the mandrel. C. M. S., JR.

122. Glass-melting furnace. LAMBTON LE BRETON MOUNT. England 1,395,591. Nov. 1, 1921. A glass melting furnace comprising a tank for molten glass having raised bottom regions at opposite sides, and a vertical flow feed outlet through each such region, a bridge beneath which the molten glass is constrained to flow before reaching the raised bottom portions, fluid fuel burning means at and above one end of the tank, a recuperator at the opposite end thereof, and a casing having recesses below the raised bottom regions of the tank for the reception of molds into which the glass is to be delivered. C. M. S., Jr.

123. Cooling device for glass-drawing apparatus. WALTER A. JONES. U. S. 1,396,216. Nov. 8, 1921. A cooling device comprising a stationary support, a cooling ring formed of complemental sections movably mounted upon the support independently of each other, and means for supplying a cooling medium to the sections.

C. M. S., JR.

124. Art of ornamenting glass articles. JOHN A. MILLIKEN. U. S. 1,396,691. Nov. 8, 1921. An improvement in the art of ornamenting hollow glass articles comprising inserting a chuck into the article without contacting therewith, temporarily attaching the chuck and the article by an interposed material capable of being applied in molten condition, subjecting the article to the action of an ornamenting apparatus by connecting the chuck and the attached article to the apparatus, and finally changing the physical condition of the interposed material to permit of separation of the chuck and the attached article. C. M. S., Jr.

125. Method of casting plate-glass and apparatus therefor. JOHN W. KUNZLER. U. S. 1,396,330. Nov. 8, 1921. The method of casting plate glass, comprising the steps of continuously feeding molten glass into a tiltable vessel, periodically tilting the vessel to pour the molten glass therein onto a casting table across the face thereof, and during such pouring operation moving the table in a direction at right angles to the axis of the vessel to spread the glass in the form of a sheet on the table and during such movement moving the table and glass under a sheet-forming roller to roll the glass to the required thickness. C. M. S., JR.

126. Sheet-glass forming apparatus. MICHAEL J. OWENS. U. S. 1,397,326. Nov. 15, 1921. In a sheet-drawing app., a receptacle for molten metal, a sheet drawing means, and an intermediate sheet bending device having a non-glaze destroying face running in contact with the glass at a point distant from the point of formation, the surface of the glass being free from contact with any solid substance until a surface glaze has formed thereon, the movement of the face being different from that of the glass.

C. M. S., JR.

127. Process of making plate-glass. JOHN H. MCKELVEY and CHARLES F. RYAN U. S. 1,397,287. Nov. 15, 1921. The process of making plate glass consisting in firs melting the constituents in a furnace, tank, or the like, then conveying and segregatin a portion of the molten glass in a collection chamber, then treating the portion by sub jecting it to a heat independent of and controlled independently of the furnace for suc period of time and at such temperature as to refine such portion, and thereafter de positing the molten glass directly upon a subjacent rolling table and finally rolling sam C. M. S., JR.

128. Machine for and method of making corrugated wire-glass. ARNO SHUMAI U. S. 1,397,149. Nov. 15, 1921. The method consists in rolling a corrugated shee of wire glass and repeatedly pressing the same corrugated parts of the rolled shee while still hot. C. M. S., JR.

129. Sheet-glass drawing machine. ORLAN P. MARCONET and WILLIAM O. CAI TER. U. S. 1,398,109. Nov. 22, 1921. In a machine for mfg. sheet glass, a furnac means for drawing the molten glass from the furnace, water jackets arranged immediate above the molten mass and at the opposite sides of the furnace, the jackets being d signed to receive the edges of the sheet in a manner whereby the edges are cooled ar hardened, and also thickened so that the sheet glass lying between the edges is afford straightness and uniformity in width, and a water inlet and outlet for each jacke C. M. S., JR.

130. Glass-rolling mechanism. JACOB SODERBERG. U. S. 1,398,046. Nov. 2 1921. In combination in glass rolling mechanism, a table, a roll, supporting tracks e tending along the sides of the table on which the roll rests, means for rotating the r to cause it to move back and forth along the table, and means for automatically lif ing the roll from the tracks when it reaches one extreme of movement, comprising tilting cradle provided with rollers for engaging the roll and supporting it for rotatio C. M. S., JR.

131. Method for producing flat parallel-shaped glass sheets. WILLIAM H. TAYLO U. S. 1,398,050. Nov. 22, 1921. The process of securing a plate to a flat bed whi consists in applying the plate to the bed forcing a mixture of plaster and liquid betwe the plate and the bed, and allowing the plaster to set. C. M. S., JR.

Enamels

132. Uses for industrial enameled equipment. MAX DONAUER. *Chem. Met. En* **25,** 1015–20(1921).—Glass enameled units, 25 to 7500 gal., serve 3 general uses, foo pharmaceutical and chem. Advantages over other containers are discussed. R. J. M. (*C. A.*)

Cement, Lime and Plaster

133. Influence of drying on the resistance of cement briquettes. F. ANSTETT. *R Mat. Constr. Trav. Pub.*, **148,** 1–2(1922).—Briquettes of artificial cement, slag ceme and of $^1/_3$ mortars with sand of each, were made, and completely immersed in wate hrs. after the mixing, for periods of 7, 37 and 90 days. Tensile strength tests were ma on some pieces, immediately after removal from the water, and on others at periods 7, 20 and 26 hrs. after removal from the water. In all cases, the strength of the bo was greatest when tested immediately after removal from the water. The streng decreased markedly as the period from the time of removal increased. A. advoca that specifications for such tests be made on the sample immediately after remo from the water. LOUIS NAVIAS

134. Manufacture and use of concrete building blocks. *Rev. Mat. Constr. Tr*

ub., **145,** 190–92, **146,** 209–11, **147,** 233–34(1921).—A general description of the aterials and methods for making agglomerate. The use of building blocks advocated.

LOUIS NAVIAS

135. Egyptian lime-silica brick. A. DUPRAZ. *Rev. Mat. Constr. Trav. Pub.*, **147,** 34–36(1921).—General description of 3 lime-silica brick plants in the vicinity of Cairo, gypt.

LOUIS NAVIAS

136. Method of chemical analysis of gypsum and plaster. A. R. *Rev. Mat. onstr. Trav. Pub.*, **147,** 232(1921).—I. *Free water.* By the loss of wt. of a 500 gm. mple heated 2 hrs. at 45°. II. *Fineness of grain.* By screening with the least abra- on. III. *Chemical analysis* made on a 100 mesh sample, dried as in I. (*a*) *Com- ned water.* 1 gm. charge heated at 215–230° to constant wt. (*b*) CO_2 *determination.* he charge from (*a*) is dissolved in 1:4 HCl, and the CO_2 collected over soda lime or austic potash. The increase in wt. is the wt. of CO_2. (*c*) *Silica and insoluble matter.* eat $^1/_2$ gm. sample in a porcelain crucible with 25 cc HCl (1 : 5), to dryness, cool, oisten with conc. HCl, add 10 cc. water, boil, and then filter. Return filtrate to cru- ble, evaporate to dryness, heating it at 120° for 1 hr., moisten residue with conc. Cl, add 25 cc. water, boil and then filter. Combine the 2 residues, ignite and weigh.) *Iron and alumina.* The filtrate from (*c*) is boiled with a few drops of conc. HNO_3. dd 2 gms. of NH_4Cl in a water soln. and make the soln. alkaline with NH_4OH. Heat as to coagulate the precipitate, then filter. Ignite and weigh as Fe_2O_3 and Al_2O_3.) *Lime.* Two methods. (1) To the ammoniacal filtrate from (*d*) add 5 gms. $(NH_4)_2$ ssolved in water, ht. for $^1/_2$ hr., filter. Ignite in a platinum crucible to constant wt.) Precipitate and filter as in (1). Transfer the precipitate to a beaker, and re-dissolve with dilute H_2SO_4. Titrate the soln. while hot with $KMnO_4$ soln. (containing 5.6339 n. per liter), the number of cc. giving directly the CaO. (*f*) *Magnesia.* Dilute the trate from (*e*) to about 600 cc.; cool, add 10 cc. NH_4OH and 5 gms. NH_4NaHPO_4 ssolved in water, stir till precipitate forms. The following day, filter and wash with $^1/_2$% NH_4NO_3 soln., ht. and weigh. Multiply the wt. found by 40/111 for the magne- a. (*g*) *Sulphur trioxide.* Dissolve $^1/_2$ gm. of prepared sample in 50 cc. of 1 : 5 HCl, oil, add 100 cc. of boiling water and continue to boil for 5 min. Filter immediately id wash with hot water. Boil the filtrate, add to it 20 cc. of a soln. of $BaCl_2$ (10% soln.). et settle for an hr., filter and wash. Ignite with as low a flame as possible till the paper charred, then strongly for 15 min. Weigh. Multiply the wt. by 80/233 for the wt. SO_3. (*h*) *Sodium chloride.* Dissolve 1 gm. of prepared sample in boiling water, ter. Add 2 or 3 drops of potassium chromate to the filtrate, and titrate with N/20 ver nitrate soln. 1 cc. of standard is equivalent to 0.002923 gm. NaCl.

LOUIS NAVIAS

137. Portland cement—its testing and specification. R. E. STRADLING. *Con- ete and Constr. Eng.*, **16,** 169–77, 223–33(1921).—A critical discussion of Am., Brit., ench and Ger. cement specifications, and cement-testing app. The essential prop- ties of cement as an engineering material are setting time within workable limits, undness (*i. e.*, no disintegration with aging), and strength sufficient for requirements. hen cement is mixed with water a considerable portion of it usually does not hydrate. very effort should be taken to increase the hydrated portion since the unhydrated rtions might more cheaply be replaced with sand. The hydration is apparently fected by (1) fineness of grinding, (2) manner and amt. of mixing, (3) amt. of water ed and (4) temp. of water used. The essentials of cement testing are (1) real indi- tions of suitability of the material for the work in hand, (2) independence of the per- nal equation and (3) shortest possible time.

J. C. WITT (*C. A.*)

138. Japanese standard rules for testing Portland cement. ANON. *Eng. World*, , 273–4(1921).

J. C. WITT (*C. A.*)

139. Heat efficiency increase in cement burning. H. LAMOUR AND W. C. STEVENSON. *Concrete* (Mill Sect.), **19**, 95–6(1921).—A proposed preheater for cement raw mix is discussed. The app. consists essentially of a vertical cylinder, divided into several chambers, placed above the upper end of a rotary kiln. The kiln gases on their way up the stack are diverted and passed through the preheater where some of the heat is absorbed and some of the dust is recovered. Expts. indicate that the temp. of the gases leaving the preheater is below 700°F and it is calcd. that the installation of a preheater will result in a saving of 24% of the fuel. J. C. WITT (*C. A.*)

PATENTS

140. Device for dry granulation of slag. F. RIEDEL. Assr. to The Chemical Foundation, Inc. U. S. 1,404,142, 17.1.22. Appl., 10.8.15. A device for dry granulation of slag comprises a cylindrical cooling wall, an atomising nozzle mounted so as to permit movement in all directions, and means for passing compressed ejecting medium through the nozzle, so that the molten slag may be thrown in a radial direction at any portion of the cooling wall. H. S. H. (*J. Chem. Ind.*)

141. Cement-kiln plant and method of operating the same. JOHN E. BELL. U. S. 1,393,738. Oct. 18, 1921. The method of operating a cement kiln plant comprising plurality of rotary cement kilns, a waste heat boiler section and a flue into which the individual kilns open at points at varying distances from the boiler section, and which connects the series of kilns to the boiler section which consists in throttling the connection between each kiln and the flue to such an extent as to make the pressure drop or draft consumption between each kiln and the flue greater than the total pressure drop or draft consumption in the flue and maintaining such draft conditions throughout the connected parts of the system as will compensate for the resistance created by the throttling of the connections and bring about a sufficient and an approx. even draft in the kilns. C. M. S., JR.

142. Waterproofing composition for cement or similar materials. H. C. BADDER. U. S. 1,396,546, Nov. 8. A mixt. adapted for waterproofing concrete is formed of clay satd. with Na silicate and dried and burnt clay satd. with $CaCl_2$ and dried. Cement 95–75% is used with 5–25% of the mixed treated silicates and a small amt. of MgSO or $CaSO_4$. (*C. A.*)

143. Waterproofing natural stone. F. P. JACKSON. U. S. 1,396,118. Nov. 8. Natural stone such as Ohio blue sandstone is freed from moisture by heating and is then impregnated with a hot mixt. of linseed oil 60, paraffin 3 and paraffin oil 40 parts in order to prep. it for use as elec. insulation or for building purposes. Coloring substances also may be used. (*C. A.*)

144. Cements, mortars, etc. K. WINKLER. Brit. 167,138. Feb. 1, 1921. Cements, mortars, concretes, etc., are rendered waterproof, adhesive, and quick-setting by being gaged with a metallic chloride soln., such as $CaCl_2$ soln. of 23° Bé., or by the addition of an equiv. amt. of solid chloride to the dry cement. Preferably from $^1/_4$–3% of $Ca(NO_3)_2$, $Sr(NO_3)_2$, $Mg(NO_3)_2$, MnO_2, MnO, BaO_2, chromic oxide, Sb_2O_3, butter of Sb, $Mn(BO_2)_2$ or sugar, or a mixt. of these substances is also added to the cement. The action of the metallic chloride is further intensified if 2–7% of coal cinders, calc-spar, feldspar, bauxite, heavy spar, or fluorspar is incorporated with it during its manu from the corresponding carbonate or oxide. (*C. A.*)

145. Artificial stone. A. J. SANDERS. Brit. 166,307. March 12, 1920. Recently formed artificial stone, composed of portland-cement mortar or asbestos-cement mortar, is impregnated in succession with solns. of 2 or more metallic salts, which react with one another and with the sol. component of the stone to form a colored ppt. Suitable salts are Pb acetate followed by Na_2CrO_4 or $K_4Fe(CN)_6$ followed by $CuCl_2$. (*C. A.*)

146. Cements. H. WADE. Brit. 169,807. July 5, 1920. A cement mixt. for use in concretes resisting the action of sea water or sulfated water comprises cement of the kind described in 170,063 with the addn. of finely ground pozzuolana, trass, basic slag, or the like in quantities sufficient to absorb the lime liberated during the setting of the concrete. (*C. A.*)

147. Cements. H. WADE. Brit. 169,808. July 5, 1920. Cements are made by calcining mixts. of limestone and leucite, both free from Fe, to which small quantities of metallic oxides are added for coloring purposes. The potash of the leucite is recovered from the kiln gases by condensation and settling in a dust chamber. (*C. A.*)

JOURNAL AMERICAN CERAMIC SOCIETY

Preparation of Abstracts

Every article in THIS JOURNAL is to be preceded by an abstract prepared by the author and submitted by him with the manuscript. The abstract is intended to serve as an aid to the reader by furnishing an index and brief summary or preliminary survey of the contents of the article; it should be suitable for reprinting in an abstract journal so as to make a reabstracting of the article unnecessary. The abstract should, therefore, **summarize all new information completely and precisely.** Furthermore, in order to enable a reader to tell at a glance what the article is about and to enable an efficient index of its subject matter to be readily prepared, the abstract should contain **a set of subtitles** which together form a **complete and precise** index of the information contained in the article. This requires at least one and often several subtitles even for a short abstract.

In the preparation of abstracts, authors should be guided by the following rules, which are illustrated by the abstracts in THIS JOURNAL for February and March, 1921.* The **new information** contained in an article should first be determined by a careful analysis; then the subtitles should be formulated; and finally the text should be written and checked.

Rules

1. **Material not new** need not be analyzed or described in detail; a valuable summary of a previous work, however, should be noted with a statement indicating its nature and scope.

2. **The subtitles should together include all the new information;** that is every measurement, observation, method, improvement, suggestion and theory which is presented by the author as new and of value in itself.

3. **Each subtitle should describe the corresponding information so precisely** that the chance of any investigator being misled into thinking the article contains the particular information he desires when it does not, or vice-versa, may be small Such a title as "A note on blue glass," for example, is evidently too indefinite a description of information regarding "Absorption spectra of glass containing various amounts of copper-cobalt and chromium-cobalt." General subtitles, such as "Purpose" and ' Results" should not be employed as they do not help to describe the specific information given in the article.

4. **The text should summarize the authors' conclusions and should transcribe numerical results of general interest,** including those that might be looked for in a table of physical and chemical constants, with an indication of the accuracy of each. It should give all the information that anyone, not a specialist in the particular field involved, might care to have in his note book.

5. **The text should be divided into as many paragraphs** as there are distinct subjects concerning which information is given, but no more than necessary. All parts of subtitles may be scattered through the text but the subject of each paragraph, however short, must be indicated at the beginning.

6. **Complete sentences** should be used except in the case of subtitles. The abstract should be made as readable as the necessary brevity will permit.

7. **The** ms. of all abstracts must be typewritten and double or triple spaced.

* The rules were prepared by the Research Information Service of the National Research Council. The Society is indebted to Dr. G. S. Fulcher of the Corning Glass Works (formerly with the National Research Council) for the rules and the illustrative abstracts.

CERAMIC ABSTRACTS

Compiled by the

AMERICAN CERAMIC SOCIETY

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General and Miscellaneous

1. Graphical treatment of stack gas analysis and fuel gas analysis. W. TRINKS. *Blast Furnace & Steel Plant*, **10**, 50–58(1922).—Charts calcd. for stack gas analysis, natural gas, by-product tar, coke-oven gas and for coal gas are based upon Walter Ostwald's "*Beitrage zur graphischen Feurungstechnik*" and upon similar papers which have appeared in German scientific journals. (Cf. *C. A.*, **14**, 257, 484, 490, 2414, 3552, 3569.) W. T. HALL (*C. A.*)

2. Pulverizing anthracite coal. HARLOWE HARDINGE. *Elec. World*, **79**, 433(1922).—Anthracite culm with an ash content of 25 to 30%, considered to be the hardest anthracite in the eastern U. S., was ground in a mill so as to allow 90% to pass a 200-mesh screen. The power required for grinding amounted to 30 h. p. hrs. per ton of coal. A softer coal with 18% ash required a total of 20 h. p. hrs. per ton ground to 200-mesh, 90%. C. G. F. (*C. A.*)

3. Heat utilization and economy in steam power plants. W. GRAULICH. *Chem.-Ztg.*, **45**, 1233–38(1921).—An elementary presentation of the principles of combustion, and heat utilization in boilers and engines, intended primarily to assist owners and operators of small power plants in effecting economies by the use of modern devices and methods. Numerical problems on heating value of fuel, boiler and engine efficiency, satd. and superheated steam, waste steam and flue gas utilization, are given in detail. W. C. EBAUGH (*C. A.*)

4. The "Gee-system," a new procedure for the separation of solid materials from liquids. C. R. PLATZMANN. *Z. angew. Chem.*, **34**, Aufsatzteil, 623–35(1921).—This filtering system is a simple combination of the filter press and the centrifuge. Its advantages are: (1) const. flow coeff., (2) rapid filtration, (3) small space requirement, (4) no clogging up of the filter surfaces, (5) little wear on the filter cloths, (6) simple tending, (7) sepn. of the filtered out solids according to size of particles, (8) possibility of using high pressure, and (9) ease of assembling and taking apart. The construction and operation of the system are fully described with the aid of three drawings. The especial advantages of this system in the *elutriation of the porcelain clays* are: (1) it reduces the cost more than half, (2) it produces a much finer-grained product than was previously possible, (3) it gives a product of highest quality regardless of the phys. condition of the clay as mined, (4) the finest particles are recovered from the filtrate, and (5) the moisture content of the sepd. clays is lower than heretofore. Other applications in *ceramics* and in the *dye, paper, coal, brewing, malting and distilling industries* are pointed out. The system is in use in the kaolin industry in Cornwallis, England. C. C. VAN VOORHIS (*C. A.*)

5. Modernize coke-oven plants. J. M. HASTINGS, JR. *Iron Trade Rev.*, **70**, 262–66; *Blast Furnace & Steel Plant*, **10**, 12–17(1922).—The Rosedale and Franklin plants of the Cambria Steel Co. at Johnstown, Pa. constructed by the Semet-Solvay Co. are described. J. L. WILEY (*C. A.*)

6. Apply powdered coal to air furnace. P. DWYER. *Foundry*, **49**, 955–62(1921).—Malleable-Fe melting furnaces and annealing ovens have been converted from hand-firing to powdered coal firing without radical changes in design. At the Marion (Ind.)

Malleable Iron Works the annealing ovens can now be raised to the required temp. of 870° in 18 hr., where hand-firing took 72 hr. The powdered coal installation is described in detail. A. Butts (*C. A.*)

7. Contributions to the history of chemical arts. F. Rathgen. *Chem.-Ztg.*, **45,** 1101–2(1921); 1 cut.—Descriptions and chem. analyses are given of (1) a Babylonian glass vase; (2) an antique Babylonian glass slab; (3) a silver ring from El-Armana; and (4) a sample of wool from a sarcophagus of the time of Alexander the Great, in which indigo was present as the coloring substance. T. F. Buehrer (*C. A.*)

8. The utilization of liquid fuels in Hoffmann kilns. L. Mascard. *Bull. soc. encour.*, **133,** 1192–95(1921).—The scarcity and expensiveness of coal in Oran (Algeria) led to the adoption of liquid fuels mixed with solid combustibles for firing Hoffmann kilns. The following methods are described: (1) Heavy petroleum fuel oils fed intermittently and by a continuous automatic process. (2) Mixts. of powdered coal and oil. (3) Mixts. of ground and screened coal cinders and smoke-box refuse with gas tar. This latter method was the most economical. In it combustion is less vigorous than with fuel oil, the fire is more easily regulated and more const.; this produces a red color in the bricks and tiles more easily. Greater fluidity of the gas tar enables the fuel to be handled easier. Better admixtures of the solid with the liquid fuel are maintained. Little or no soot is formed, and after 17 months' continuous operation less than 300 kg. was deposited. A. R. Albouze (*C. A.*)

9. Kinetic and static coagulation measurements with suspensions. F.-V. v. Hahn. *Z. Elektrochem.*, **27,** 501–5(1921); cf. *C. A.*, **16,** 516.—The distinguishing characteristics of the different disperse systems are tabulated and discussed. Whether a sol belongs to the mol. system or not can be detd. by ascertaining whether it undergoes coagulation or flocculation. A kinetic method for coagulation measurements with suspensions is described. This method depends on weighing the sedimented suspensoid or detg. the d. of the dispersion medium over the sediment. Graphic representation of the results of coagulation measurements by this method shows that they agree with those obtained by the static method. H. Jermain Creighton (*C. A.*)

10. Fuel economy. Excess air as a cause of waste. S. N. Duguid. *Iron and Coal Trades Rev.*, **104,** 75–6(1922).—The principal losses in a boiler plant are estd. as follows: loss by handling 1%, in ash 3.9, radiation 2.9, incomplete combustion 0.7, excess air 19.6, faulty baffles 1.1, soot 3.8, scale 5.0, incorrect correlation of load and draft 3.8. D. shows how the loss due to excess air can be reduced and how efficiency can be increased by use of gas analyzers and CO_2 recorders. J. L. Wiley (*C. A.*)

11. Use of medium-grade gases in the steel industry. F. J. Denk. *Blast Furnace & Steel Plant*, **9,** 719–21(1921).—Natural gas, even with its high heating value, is not the best available gas to use in steel plant heating. The efficiency of a gas does not depend upon its heating value, but upon the flame temp., the amt. of air required for combustion, the sp. heat of the waste gases, and their quantity. For the above reasons coke-oven gas or Elliott gas, a combination coal and water gas made in the Elliott producer, is more efficient. The amt. of the latter made from 1 ton of coal varies between 57,000 and 63,000 cu. ft. with a heating value of 465 and 415 B.t.u. and the same sp. gr. as coke-oven gas. Comparative tests on open-hearth furnaces fired with producer gas of 143 B.t.u. and with coke-oven gas of 408 B.t.u. gave the following results: with the former 1 long ton of steel required 661.5 lb. of coal but only 11,477 cu. ft. of coke-oven gas; assuming a producer efficiency of 89%, the heat equiv. of the 2 fuels was 1414 B.t.u. for the former and 1000 for the latter, while the daily output was, resp., 39 and 49 tons. The av. life of a 30-ton furnace with coke-oven gas was 3.5 month with 10725 tons of steel, with producer gas 2.5 months and 8016 tons of steel. In a 100-ton furnace the respective tonnages per charge were 97.3 and 96.5 tons. In a 12-ton furnace

the respective daily production was 48 and 39 tons, the av. consumption of coke-oven gas being 9888 cu. ft. per ton. The advantages of using coke-oven or Elliott gas are: increased production, simplification in furnace construction, lower repair, initial and operating costs, and easier working of the charge. By applying Steck's formula for calcg. the relative value of the different gases, coke-oven gas is found to be 1.85 times and Elliott gas 2.21 times more efficient than producer gas. J. L. WILEY (*C. A.*)

12. A new incandescent burner for kerosene and heavy hydrocarbons. P. WAGUET. *Rev. prod. chim.*, **24,** 779–80(1921).—The fuel passes from the reservoir, through a wool filter and needle valve, into a pipe which rises close to the mantle, into a coil over the top of the mantle, then through a descending tube terminating in a fine opening, and finally through a tube like that of a Bunsen burner, which is curved to bring the vapors under the grating. To light the burner the reservoir is put under a pressure of about 1.5–2 kg. (about 20–27 lb. per in.^{2}) and a little alc. is burned to heat up the fuel in the tube beside the mantle and vaporize it. Various types of this burner have been designed for service under special conditions. For heating purposes the mantle is dispensed with, and the flame is that of a regular Bunsen. It is cheaper and safer than gasoline or compressed C_2H_2 burners. A. P.-C. (*C. A.*)

13. Gaseous firing for industrial purposes. F. J. BOSTOCK. *Gas. J.*, **156,** 882–84; *Gas World*, **75,** 573–5(1921).—For general purposes, the most economical method of using solid fuel is to subject it to destructive distn. The advantages of this are discussed. B. compares the methods of gaseous firing by low pressure, high pressure gas and air blast, and gas and air mixt. The latter method is the most practical soln. to the problem of gaseous firing. A special type of gas and air incorporator made in accordance with the Docking patents is described. It is capable of being automatically adjusted according to the quality of the gas and the temp. desired. Its application is broad and furthers economy in operation. The cost of gas for metal melting is compared to that of electricity. J. L. W. (*C. A.*)

14. Bentonite. R. B. LADOO. Bur. of Mines, *Repts. of Invest.*, No. **2289,** 5 pp.(1921).—Bentonite is a clay-like group of materials of rather indefinite compn. characterized by an easily replaceable alk. and alk. earth content of 5 to 10%, fine grain size, high absorptive power and colloidal properties. H_2O contg. $CaSO_4$ can be softened by passing through especially treated bentonite. It is utilized in the manuf. of *antiphlogistine* and other medical prepns.; as a retarder in the manuf. of gypsum wall plaster; as a *soap filler* as *paper filler* and as a *candy adulterant.* Its use in soap is not adulteration for it actually increases the lathering and detergent properties. Eight analyses of samples from different sources show ranges in compn. as follows: SiO_2 54.00 to 63.20, Al_2O_3 11.84 to 26.58, Fe_2O_3 2.46 to 3.97, CaO 0.59 to 4.94, MgO 1.01 to 3.24, K_2O 0.00 to 2.34 and Na_2O 0.66 to 4.33. D. B. DILL (*C. A.*)

15. Powdered fuel. J. S. ATKINSON. *Iron and Coal Trades Rev.*, **103,** 802(1921).—A description is given of a self-contained unit, called the *Turbo pulverizer*, which drys, pulverizes and feeds the coal to the furnace with the proper amt. of air for combustion. The installation has proved satisfactory, both with regard to furnace temp. and conditions, and to coal economy. In connection with a forge furnace the av. coal consumption for 6 mo. was 176 lb. per ton of metal; with a tube-heating furnace over 9 months, 4 cwt. per hr. for each 30 cwt. of metal. The av. cost for 300 days of coal pulverizing with a 1-ton per hr. installation was 2 s. 10 d. **The Turbo pulverizer** ANON. *Ibid.*, 877.—A description with diagram. J. L. WILEY (*C. A.*)

16. Pulverized coal as fuel. E. B. POWELL. *Elec. World*, **79,** 273–4(1922).—A brief survey. The utilization of waste fuels is emphasized. C. G. F. (*C. A.*)

17. Coal and coke mixtures as water-gas generator fuel. W. W. ODELL. Bur. of Mines, *Tech. Paper*, No. **284,** 32 pp.(1921); cf. *C. A.*, **15,** 1204.—Information is given

bearing on the effect of a stand-over period on capacity and possibilities in the use of the blow-run method of operating with mixed fuels, coal and coke. Data are included on the behavior of the various fuels used, the clinker conditions, the use of fuel high in ash and S. It was found that a decided benefit is realized when operating with a long lay-over period. When operating but a small part of the day, up to 8 hr., the capacity of the plant can be maintained in using 100% coal, but with the same vol. of air per min. per sq. ft. of grate area, the make per sq. ft. of grate per run hr. decreases markedly after that time until the hourly make is less than the normal make with coke. All bituminous coals do not behave the same and the method of operating should be worked out for each coal in order to obtain the best results. The size of fuel used is of importance and should be given more attention when using coal than when coke or mixed fuel. With coal blowholes form more often than with coke, especially when the coal is composed chiefly of large lumps and some slack. With mixed coal and coke no trouble appears unless the coal is in greater amts. than 60% by wt.; as % of coal increases the difficulty increases especially with high blast pressures and when no fuel spreader is used. The symptoms, cause and remedy for blowholes are discussed. The relative value of the air purge using coal, coke, and mixts. of each is shown and gas analyses are given. More benefit is to be derived from an air purge with coal fuel, or with coal and coke mixts., than with coke as the % of CH_4 and illuminants increase during the run and to a considerable extent neutralize the effect of the increasing % of CO_2. With mixed fuel, coal and coke: the tendency for caking and arching of the fuel in the generator is *nil* unless a high % of coal is used; the clinker troubles are not necessarily over those prevailing with coke alone; the fuel per M with blow-run operation is appreciably less than with 100% coal and the oil consumption is no higher; the capacity with blow-run operation is greater than can be obtained with 100% coal and may equal or surpass that with 100% coke; a more uniform gas standard can be obtained; trouble is less from tar emulsions, the tar settles out to about 1% H_2O; boiler fuel per M is no greater than with 100% coke. J. L. Wiley (*C. A.*)

18. Some critical observations on the generation of producer gas. J. Gwosdz. *Brennstoff Chem.*, **2**, 345–6(1921); See *C. A.*, **15**, 3549.—Review of proposals to produce low-N gas by means of external heating. W. B. V. (*C. A.*)

19. Lean coals tested in gas producer. J. Blizard and E. S. Malloch. Can. Dept. Mines, *Bull.* **33**; *Gas Age Record*, **49**, 135–6(1922).—An abstract of the results obtained with 25 Canadian lignites in a Westinghouse, double-zone, suction-gas producer. About ½ of the fuels tested can be recommended for continuous operation in this type of producer. The gas produced ranged from 51 to 106 cu. ft. per lb. of fuel, and from 75 to 120 B.t.u. The net B.t.u. efficiency ranged from 40 to 94.

J. L. Wiley (*C. A.*)

20. Continuous water-gas producer. A. W. H. Griepe. *Am. Gas. J.*, **116**, 53–4 (1922).—The advantages over the intermittent type are: continuous flow and uniform quality of gas, clean gas and reduction in operating cost. The operation is as follows: In a producer shell is placed a hot plate heated by external gas burners. Steam from nozzles forces the powdered fuel and steam onto the hot plate, igniting the C and decomposing the steam into H_2 and O_2. Any grade of powdered coal can be used. The coal and steam are kept in the ratio of 2 to 3. The net amt. of gas produced from 1 lb. of C and 1.5 lb. of steam is 45 cu. ft. (18 cu. ft. are used for heating the plate). The gas compn. is: H_2 48.53%, Co 50.2, CH_4 0.785, O_2 0.015, CO_2 0.47, and 300 B.t.u. assuming 75% efficiency of the app. The cost per 1000 cu. ft. with coal at $5.50 per ton and water $1.00 per gal. is 12 cents. J. L. W. (*C. A.*)

21. Cleaning producer gas made from bituminous coal. H. W. Seldon. *Blast Furnace & Steel Plant*, **9**, 708–10(1921).—There is neither evidence nor sufficient reason

for cleaning producer gas except where it is absolutely necessary before the gas can be used for gas engine fuel or where the point of consumption is so far removed from the producer that deposits in the main cause trouble. All the known methods for cleaning sacrifice the sensible heat of the gas in addition to the B.t.u. value of the tar and volatile hydrocarbons. The combined loss is probably in excess of 20% of the heating value of the coal. It is calcd. that the sensible heat loss in cooling the gas to atm. temp. is equal to 11.6%. Thus it would be too costly from a fuel standpoint besides resulting in a gas unsuitable for the open-hearth furnace. J. L. WILEY (*C. A.*)

22. Using clean cold producer gas. C. F. KAUFMAN. *Iron Trade Rev.*, **70**, 267–70 (1922).—K. traces the development of the Smith glass-wool tar extractor and its use in connection with the Smith up-draft type of producer using bituminous coal or lignite as the fuel. The tar extractor consists of a mat of spun glass held firmly between 2 perforated plates and located in the gas line beyond the producer. A pressure of 2–3 lb. per sq. in. is necessary. It functions by collecting the tar fog into drops which are too heavy to be carried along by the gas stream and therefore are condensed and drain off. It has a cleaning efficiency of over 99.5%. It requires less power than mech. scrubbers, is much more efficient, and H_2O is not used in its operation, consequently no emulsions are formed, and the tar and H_2O in the gas can be sepd., the tar being returned to the producer for gasification. It is shown that illuminants in gas are not essential to furnace efficiency; therefore, the removal of them and the return of the tar to the producer to be gasified does away with the objection that the loss of B.t.u. value is detrimental to the heating quality of the gas and to efficient furnace operation. By this method the gas gains in quality owing to the increase in the $H–CH_4$ ratio and the CO content. Clean cold producer gas contains also a smaller amt. of S. The sensible heat is not wasted by cooling and cleaning the gas but is removed in the gas plant and taken up again in the regenerators in the furnace with a lowering of the stack temp. (Cf. Seldon, preceding abstract.) J. L. WILEY (*C. A.*)

PATENTS

23. Gas manufacture. KOPPERS CO. Brit. 170,572, Oct. 6, 1921. Fuel gases, such as coke-oven gases, are purified from CO_2 and H_2S by being passed through a pipe into scrubbers contg. Na_2CO_3, the gas then passing by a pipe to Fe oxide purifiers for the absorption of any traces of H_2S remaining. The foul soln. is passed from the scrubbers by a pipe through a heater to a hot well and is raised by a pump to the top of a cooling tower in which the H_2S, CO_2 and CN compds. are driven out by a current of air or inert gas, and the revivified soln. from a basin is returned by a pump and pipe to the scrubbers. A portion of the soln. from the basin is passed by a pump to primary gas coolers, being thereby heated, and is returned by a pipe to the hot well to raise the temp. therein. A suitable construction is specified. (*C. A.*)

24. Heat insulation. E. T. HOLMBERG. U. S. 1,404,438, Jan. 24. A heat-insulating material adapted for use in metal cabinets is formed by moistening a mixt. of MgO 30 and infusorial siliceous earth 70% with a satd. soln. of $MgCl_2$ and compressing the mixt. in a mold. (*C. A.*)

25. Separating feldspar and quartz (hydraulic concentration). F. P. KNIGHT AND J. T. SHIMMIN. U. S. 1,404,974, Jan. 31. (*C. A.*)

26. Artificial meerschaum. P. DEUSSING. Brit. 172,004, Nov. 18, 1921. Addition to 164,319 (*Ceram. Abs.*, **5**, 59(1922)). The artificial meerschaum described in the principal patent, and consisting substantially of Hallic earth or roasted Meissner clay, raw Meissner clay, whiting, and quartz dust, is improved by the addition of kieselguhr to the ingredients or by substituting kieselguhr for the quartz dust. The compn. is molded, roasted, and finished in the manner described in the principal patent. (*C. A.*)

27. Filtering and oil-decolorizing earth. R. G. TELLIER. U. S. 1,402,112, Jan. 3. A filtering and oil-decolorizing material is prepd. by baking and oxidizing fuller's earth while agitated in an air current at a temp. of about 400–700°. (*C. A.*)

28. Heat-insulating material. H. S. ASHENHURST. U. S. 1,402,133, Jan. 3. An insulating material of light wt. is formed of $Al_2(SO_4)_3$, $MgCO_3$, gypsum and H_2O, with or without fiber, and a retarder. (*C. A.*)

29. Manufacture of carbon arc electrodes. W. MATHIESEN. G. P. 341,240, 31.7.20. Carbon prior to the burning process is subjected to pressure considerably higher than that employed in the moulding process. Such carbons used in the arc afford a higher crater temperature and greater light emission.

J. S. G. T. (*Jour. Chem. Ind.*)

Apparatus and Instruments

30. Electric carbon dioxide recording instrument. M. MOELLER. *Siemens Z.*, Dec., **1921**; *Elec. World*, **79**, 293(1922).—The temp. of an elec. heated resistance wire will depend upon the heat cond. of the gas surrounding this wire. The heat cond. of CO_2 is about 40% less than that of all the other gases contained in the flues of boilers. Consequently the temp. of the wire will be proportioned to the percentage of CO_2 contained in the flue gases. By using 2 wires, one operating in the flue gas and the other in air their temp. difference is detd. by their proportional ohmic difference. An instrument indicating directly CO_2% is used in parallel with a galvanometer. Fine Pt wires are used which change their resistance about 3.5% for each 10° temp. rise.

C. G. F. (*C. A.*)

31. A new comparison apparatus for colorimetric determination. O. MANNEBACH. *Chem.-Ztg.*, **46**, 20(1922).—The comparison tubes stand obliquely in a beaker of H_2O which is placed in a wooden box, black inside, open at the top, and with a round hole slightly smaller than the bottom of the beaker cut in the bottom. Under the box is a reflector which throws a suitable light up through the beaker, enabling a comparison of the most delicate tints. J. H. MOORE (*C. A.*)

32. A new radiation pyrometer. ANON. *Chem.-Ztg.*, **46**, 20–1(1922); 2 cuts.—The app. resembles a small telescope and may be used in the hand or on a tripod. The object or part of the furnace to be tested is brought sharply into the field of vision, the heat rays being at the same time automatically focused on the thermoelement which is seen in the field. The temp. is read on a scale just over the eye-piece. The app. may also be attached to a recorder, is accurate within 10–15° at 1000°, may be constructed with scales from 500–2000°, and, above 1 m., is independent of the distance of the object so long as the image of the latter in the field completely covers the thermoelement.

J. H. MOORE (*C. A.*)

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33. Apparatus for electrical precipitation of suspended particles from gases. L. BRADLEY. U. S. 1,400,795, Dec. 20. (*C. A.*)

34. Gas calorimeters. W. B. DAVISON. Brit. 171,246, Sept. 13, 1920. The products of combustion are brought into intimate association with a cooling liquid by passing both the products and the liquid through a common divided medium. (*C. A.*)

35. Viscosimeters. R. L. FRINK. Brit. 171,774, Aug. 20, 1920. The app. is particularly intended for measuring the viscosity of highly viscous materials, such as molten glass, and comprizes an angularly displaceable or rotatable member contacting with the material and means for measuring the speed of rotation of this member produced by a const. torque, or the torque required to produce a const. angular velocity. (*C. A.*)

36. Centrifugal separator. F. H. LINDENBERG. U. S. P. 1,395,193, 25.10.21. Appl., 8.3.17. A perforated conical basket with the wider end uppermost is adapted

to revolve about a vertical axis and is mounted for universal rotation about a centre in the axis. Spiral vanes within the basket are arranged to revolve differentially in the same direction as the basket to control the upward movement of material upon the surface of the basket. The basket and the vanes are revolved at speeds bearing a definite ratio by means acting in the transverse plane of the centre of rotation.

H. H. (*Jour. Chem. Ind.*)

37. Vacuum filtration apparatus. A. T. Cartner, R. Clewer, and Mather and Platt, Ltd. E. P. 170,788, 21.1.21. A liquor trap is provided between the receiver and air pump of a vacuum filtration apparatus. The inlet pipe from the receiver extends nearly to the bottom of the trap and the outlet pipe to the pump terminates near the top and is provided with a valve seat adapted to be closed by a floating ball. Another valve operated by a float is adapted to admit air to break the vacuum in the event of the liquor rising too high. Perforated diaphragms are also provided within the trap on which may be placed an absorbent for any corrosive gases given off by the filtered liquor. B. M. V. (*Jour. Chem. Ind.*)

38. Filling material for use in Glover towers and similar apparatus. P. Kestner. E. P. 170,982, 18.8.20. Addn. to 131,502 (J., 1919, 746A). The rings of ceramic material are made by stamping them in the form of truncated cones from a layer of ceramic paste by means of cutting punches. J. S. G. T. (*Jour. Chem. Ind.*)

Chemistry, Physics and Geology

39. Vapor pressure of some salts. II. H v. Wartenberg and H. Schulze. *Z. Elektrochem.*, **27**, 568–73(1921); cf. *C. A.*, **15**, 2376.—Measurements have been made of the vapor pressures of LiCl, CsCl, RbCl, LiBr, CsBr, RbBr, NaF, KF, LiF, CsF, RbF, NaI, CsI and RbI at a no. of temps. between the b. p. of the salt and 200–300° below the b. p. The vapor-pressure curves of the different fluorides are widely separated from one another; those of the other classes of salts lie closer together the higher the at. wt. of the halogen. H. Jermain Creighton (*C. A.*)

40. Some conclusions in regard to the origin of gypsum. F. A. Wilder. *Bull. Geol. Soc. Am.*, **32**, 385–94(1921).—Gypsum deposits contg. less than 0.05% of $CaCO_3$ cannot have formed by the evapn. of sea water or of stream-fed inland basins. Circulating water which has dissolved disseminated gypsum is a primary factor in the formation of recent gypsum deposits. These deposits are further augmented by wind action and evapn. in inland lakes. The alteration of carbonate rocks or anhydrite may also explain some gypsum formations. W. F. Hunt (*C. A.*)

41. Recent advances in science—Mineralogy and crystallography. A. Scott. *Sci. Progress*, **16**, 374–77(1922).—Review of recent work in chem. crystallography.

J. S. H. (*C. A.*)

42. Metasomatism in siliceous rocks. V. M. Goldschmidt. *Geol. För. Förh.*, **43**, 463–8(1921).—An advance summary. W. Segerblom (*C. A.*)

43. Notes on sodium silicate. A. Erdenbrecher. *Mikrokosmos*, **15**, 55–60(1921).—The no. of mols. of H_2O which crystallize with Na_2SiO_3 depends on the compn. of the mother liquor. When 20–25 g. Na_2SiO_3 .9–10H_2O are dissolved in 40 cc. H_2O, the addn. of not more than 40 g. NaOH per 100 cc. of soln. yields $Na_2SiO_3.9H_2O$, rhombic, m. 47°; of 60 g. NaOH yields $Na_2SiO_3.6H_2O$, monoclinic, m. 63.5°; and of larger amts. of alkali yield $Na_2SiO_3.4H_2O$, hexagonal, m. 83–85°. Other hydrates of the metasilicate mentioned in the literature are probably mixts. of these as changes in the compn. of the mother liquor cause the crystals to change their degree of hydration. Excellent photographs of the various hydrates and their transformations are given.

W. S. (*C. A.*)

44. Electrical dust precipitation and gas purification (Cottrell process). L. Plasz. *Metall. u. Erz.*, **18,** 539–47(1921).—The efficiency of com. pptg. app. varies from 86% on carbide furnaces to 99.99% on brown-coal combustion gases. The app. works without difficulty at 550°. About 50 plants are working in Germany and 200 elsewhere including about 100 in the U. S. Details of construction and operation are given.

R. S. D. (*C. A.*)

45. The determination of density and the methods of expressing it. F. Bordas and F. Touplain. *Bull. soc. encour.*, **133,** 1052–74(1921).—B. and T. discuss the various methods of expressing d. and the various methods of detg. it. They make a plea for a more definite statement of the method and conditions under which detns. are carried out, show the errors inherent in each method and the corrections to be applied in each case to get the abs. $d\frac{t^\circ}{4^\circ}$ *in vacuo* from the results obtained directly, and advise the use of the sp. gr. balance in preference to hydrometers, applying the necessary corrections, as otherwise the figures obtained are quite arbitrary. For purely scientific work the abs. d. *in vacuo* should be used to the exclusion of all others.

A. P.-C. (*C. A.*)

46. Diffusion in porous vessels. A. L. Herrera. *Mem. rev. soc. cient. "Antonio Alzate,"* **39,** 343–47(1921).—When solns. of reactive salts are allowed to diffuse very slowly together, the ppts. or crystals formed show analogies to natural cells. A soln. of K silicate, d. 1.5 or more, contg. K_2CO_3 not in excess of *N*, is placed inside an unglazed porcelain cup, and the latter placed in $CaCl_2$ soln. of 1° Bé. After 24 hrs. numerous very fine tubes of Ca silicate are formed on the outside of the porous cup, which bear on their surface microscopic cells, and in some cases are formed entirely of the latter.

M. R. S. (*C. A.*)

47. Liesegang ring formation. H. A. McGuigan. *Science*, **55,** 100–1(1922); cf. *C. A.*, **15,** 3011.—Polemic with Bradford, *C. A.*, **16,** 518. F. L. Browne (*C. A.*)

48. General colloid chemistry. IV. The physical-chemical analysis of aluminium oxy salts and aluminium oxide sols. Mona Adolf and Wolfgang Pauli. *Kolloid-Z.* **29,** 281–87(1921).—Heating an excess of thoroughly washed $Al(OH)_3$ for a day with HCl gave a sol characterized by its inability to pass through parchment paper and by the fact that a small amt. of electrolyte coagulated it. The limiting value for the compn. of the sol was $[Al(OH)_3]_2.AlOCl$ and this value could be exceeded very little. By regulating the amt. of acid the pure oxy salts $Al(OH)Cl_2$ or AlOCl could be easily prepd. Neither a mixture nor an intermediate oxy salt between these two was obtained. By comparison with the mol. cond. of salts such as NaCl, $BaCl_2$ and $AlCl_3$, $Al(OH)Cl_2$ was shown to form three ions. The degree of ionization increased rapidly with diln. The steps by which ionization occurred, from the formation of $Al(OH)Cl^-$ to that of OH^- ions, could be followed by measuring the concn. of free Cl^- and of H^+ ions. The degree of hydrolysis was very small, being 0.25% as compared to 4.5% for $AlCl_3$ at a diln., $V = 1024$. The equiv. cond. for the Al constituent was normal for very dil. solns. but was surprisingly high, 99.7 mhos. at 0.068 *N*, at moderate dilns. This would be true if in addition to the normal ionization of $Al(OH)Cl_2$, complex ionization occurred so that free Cl^- ions would be used up, *e. g.*, $Al(OH)Cl_3|Al(OH)Cl$. Similar ionization has been shown for Zr compds. (cf. *Ceram. Abs.*, **5,** 104(1922)). Further proof of the fact was given by electroendosmosis expts. in a Landsteiner-Pauli app. At moderate dilns. both positive and negative Al constituents were present, while in very dil. solns. only the positive were present. Similar analysis of aluminyl monochloride, $Al(OH)_2Cl$ or AlOCl, proved it to be a two-ion compd. and that complex ionization, such as $Al(OH)_2Cl_2|AlO$, probably occurred. H. M. McLaughlin (*C. A.*)

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49. Alumina. D. TYLER. Brit. 172,087, Aug. 24, 1920. Al ores or Al-contg. materials such as clay, slags, or ashes are mixed with CaO or equiv. Ca or Mg compd. in such quantity that there are at least two mols. of CaO, etc., for every mol. of SiO_2 and in addition at least 1 mol. of CaO, etc., for every mol. of Al_2O_3. Allowance is made for any base that may be present. The materials are finely ground and then calcined; a flux such as fluorspar may be added. The product is treated with a soln. of an alkali salt such as Na_2CO_3 in order to give alkali aluminate and an insol. Ca or Mg salt. The former is then treated for the production of Al_2O_3. The $CaSiO_3$ which is left after the extn. is particularly suitable in *cement* manuf., since it is free from insol. alkali salts. Any potash present in the raw material is rendered sol. and is recovered from the alkali left after the pptn. of the Al_2O_3. Cf. 9662, **1915** (*C. A.*, **11**, 89). (*C. A.*)

50. Alumina and potassium compounds from feldspar or similar material. H. P. BASSETT. U. S. 1,404,083, Jan. 17. Feldspar or similar material is heated to redness with Na_2CO_3, Fe_2O_3, lime and Na_2SO_4 or NaCl for 1 hr. and the resulting reaction mixt. is treated with NaOH to form Na aluminate, which may be converted into pure $Al(OH)_3$. (*C. A.*)

51. Zinc oxide. METALLBANK UND METALLURGISCHE, AKT. GES. Brit. 170,082, July 9, 1920. $CaSO_4$-contg. Zn ppts. resulting from the treatment of Zn liquors contg. sulfate with CaO are freed substantially from their S content by heating and stirring the ppt. suspended in a soln. containing $ZnCl_2$ and Na or Ca chloride, and calcining the resulting basic $ZnSO_4$ after washing with H_2O to free it from $CaCl_2$, etc. The $ZnCl_2$ should be approx. equiv. to the sulfate present and may be added from external sources or may be prepd. *in situ* by means of the Na or Ca chloride. Alternatively, the process may be carried out during the pptn. of the $CaSO_4$-contg. $Zn(OH)_2$. Dil. milk of lime is slowly added to the Zn liquor heated, *e. g.*, to about 70°, to which has been added Na or Ca chloride. If the liquor has a high sulfate content it may be reduced prior to the above treatment by adding NaCl and crystg. out the resulting Glauber's salt. High concns. of Zn and of neutral salts such as Na and Ca chlorides facilitate the formation of the basic sulfate. (*C. A.*)

52. Electrolysis. C. E. HOLLAND. Brit. 171,670, Sept. 7, 1921. Finely divided coal and other org. matter, such as hydrocarbons suspended in H_2O, are coagulated and pptd. by electrolysis. A suitable app. is specified. (*C. A.*)

53. Concentrating ores. L. A. WOOD AND MINERALS SEPARATION, LTD. Brit 170,944, July 30, 1920. In a froth-flotation process, products obtained by treating viscous substances such as tars, fuel oil, or tar oil, with emulsifying agents such as caustic alkalies, carbonates, soaps, Na resinate, or mixts. thereof, are used as frothing agents or as a source of or in conjunction with frothing agents. *E. g.*, producer-gas tar may be heated with an aq. soln. of NaOH. Cf. 18,943, **1910** and 5454, **1915** (*C. A.* **10**, 2461) and *C. A.* **16**, 233. (*C. A.*)

Refractories and Furnaces

54. The illumination of the interior of kilns. ANON. *Taschen buch für Keramiker Keram. Rundschau*, **1922**, 41–42.—The illumination of the interior of pottery kilns during the setting and removing of the ware is a problem for manufacturers not equipped with elec. Kerosene lamps are dangerous since the kilns are emptied while still hot which may cause an explosion of the lamp. Rape-seed oil lamps have the advantage over kerosene in that they do not explode but these lamps give off an offensive odor when used in hot kilns which make them undesirable. Acetylene lamps have been found to be the best for this purpose since they do not explode or give off an offensive odor. H. G. SCHURECHT

55. Hot-blast stove rating. F. H. Wilcox. *Blast Furnace Steel Plant*, **10**, 29–32 (1922).—Stoves should be able to carry 1250° straight line heat, with a margin of heat reserve. It is good practice to burden the furnace to the max. degree on as high a blast temp. as it is possible to hold and maintain a heat reserve for emergencies. Coke consumption depends on the heating capacity of the stoves. The influence of five different checker sizes and of 3 and 4 stove combinations are shown for a 600-ton furnace. Brick of 1″ in depth functions efficiently in heat input and output. 400° is the practical limit for drop of temp. in stove brickwork. The load in a stove because of alternate heating and cooling is a "live load." Failures may come from springdown of tile arches and piers, shifting of checkers, expansion of ring walls and checkers or failure of dome. Operating troubles may be fluttering or surging, inefficient use of all of the checker area and insufficient draft due to small chimney valves, draft chambers and stacks. The most efficient dimensions of brick and checkers and the no. of stoves are discussed.
Jas. O. Handy (*C. A.*)

56. An electrically heated forging and heat-treating furnace. G. M. Little. *Trans. Am. Soc. Steel Treating*, **2**, 228–36(1921).—An account of the development of a resistance type elec. furnace for high temp. work. By surrounding a heating element of C plates, clamped together, with a blanket of hydrocarbon vapors, greater crowding is possible, thus permitting the production of a larger amount of heated metal. The heating element is suspended across the furnace chamber free from the walls or roof; the top lining to the furnace chamber is composed of bars of C covered with a thick layer of coke dust. The roof can not be melted and is protected from oxidation by the same blanket of hydrocarbon vapors which protects the heating element. Some data on the performance and cost of operation are given.
W. A. Mudge (*C. A.*)

57. Refractories and their application to gas works and coke ovens. P. G. Strassmann. *Gas u. Wasserfach*, **64**, 777–81, 798–801, 811–18(1921).—The clay and quartzite resources of Germany, their properties, and manuf. into refractories are discussed.
J. L. Wiley (*C. A.*)

58. The electric furnace in melting and refining. J. B. C. Kershaw. *Electrician*, **87**, 636–39(1921).—A review of the status of the elec. furnace in the English Fe and steel industry during 1921. The tendency in design has been to increase the power of the transformers rather than to follow the German and American tendency to increase the size of the furnace. The Héroult and the Electrometals are the furnaces most in favor.
Louis Jordan (*C. A.*)

59. Expansion of some refractory materials at high temperatures. B. Bogitch. *Compt. rend.*, **173**, 1358–60(1921).—Expansion curves for bricks of fused bauxite, clay, silica, chromite, and magnesia over the temperature range 0° to 1600°C are given. The smallest expansion is shown by the fused bauxite, which is suitable for the construction of furnaces subject to sudden changes in temperature. Silica bricks showed the most irregular expansion. They expanded rapidly up to 600°C and then only very slowly, and above 1000°C showed a slight contraction. The curve shows two break points at vacuum. It forms a crystalline, snow-white powder, readily soluble in water.
E. H. R. (*Jour. Chem. Ind.*)

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60. Calcining alunite. H. F. Chappell. U. S. 1,401,136, Dec. 27. Alunite is calcined at a temp. sufficiently high to volatilize K_2SO_4 and convert all the Al compds. present into Al_2O_3. The mass is agglutinated at its surface by the partial fusion and softening of the K_2SO_4 and the agglutinated superficial layer is removed as it forms from the zone of high temp. in order to avoid volatilization of the K_2SO_4 which would otherwise occur. According to U. S. 1,401,137, Dec. 27, alunite is heated, after the greater

portion of the fumes of Sioxides have been given off, in the combustion zone of a rotary kiln in order to complete calcination. (*C. A.*)

61. Treating alunite. M. Shoeld. U. S. 1,401,741, Dec. 27. Alunite is heated to about 500–600° with 3–5% of C in a reducing atm. partially to decompose the Al sulfate without decompn. or volatilization of the K_2SO_4. The products are dissolved and crystd. (*C. A.*)

62. Brick furnaces or kilns. J. Boyer. E. P. 172,062, July 28, 1920. A single kiln, or each of a series of kilns, is provided with a partition, open at the top, whereby gases burnt on one side of the partition pass over it, through the material (bricks) to be fired on the opposite side of the partition and then pass out through flues in the floor of the kiln, the gases being supplied by a gas plant and drawn, with the air required for combustion, through the kilns by a suction fan. The chambers and flues may, if desired, be built of the materials to be heated or dried. When the kilns are arranged in series the hot gases may pass consecutively from one to another so as to heat each chamber in turn, suitable shutters being provided to control the flow of the gases, or the kilns may be arranged to form a tunnel, each chamber being then composed of two fixed side walls, with two movable walls built on the platform of a wagon which travels on a track through the kilns. The walls of the chambers may be made with parts of U-shape, the limbs of which engage with one another, so that one set of walls may be moved with respect to the other set and the size and shape of the chamber altered accordingly. Each kiln may also be provided with a heat-recuperating chamber, either movable or fixed, for heating the air required for the combustion of the gases. Such air may, if desired, be blown into the kiln under pressure. A. B. S. (*Jour. Chem. Ind.*)

63. Gas-fired continuous kilns. J. and H. Morton. E. P. 172,099, Aug. 28, 1920. In a gas-fired kiln having a number of chambers arranged in series, each chamber is in direct communication with the adjacent chamber through a number of apertures provided with dampers which are clamped between an angle-iron rail and a flat rail. These rails are supported on rollers in a transverse trough below the floor-level, the top of the trough being closed by bricks. The outer end of the rail projects into a recess in the outer wall of the kiln and is provided with a lever and screw mechanism by means of which the slabs can be caused to cover or uncover the openings to any desired extent. A. B. S. (*Jour. Chem. Ind.*)

Abrasive

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64. Abrasive. C. J. Brockbank. U. S. 1,402,714, Jan. 3. Bauxite is roasted with Na_2CO_3 or K_2CO_3 to combine with oxides present as impurities and the oxides are subsequently removed by fusion with C and treatment with H_2SO_4. (*C. A.*)

Stoneware, Whiteware and Porcelain

65. Porcelains for electric insulators. O. Boudouard. *Chimie et industrie*, **6**, 583–91(1921).—See *Jour. Am. Ceram. Soc.*, **4**, 246(1921). A. P.-C. (*C. A.*)

66. Present demands on porcelain insulators. W. Weiker. *Elektrotechn. Z.*, **41**, 1475(1921); **42**, 1508(1922).—A very comprehensive review. C. G. F. (*C. A.*)

Art and Design

See Abs. 7.

67. Relation between silica, alumina and basic oxides in porcelain glazes fired at high temperatures. Yaichiro Kitamura. *J. Chem. Ind.* (Japan), **24**, 89–105(1921).—227 different combinations were prepd. within limits of 1.0 RO, 0.2–2.2 Al_2O_3, 4.0–

26.0 SiO_2, using for RO, 0.5 KNaO + 0.5 CaO in one set, and 0.1 KNaO + 0.9 CaO for the balance. The Al_2O_3 was varied in 0.2 equiv. steps and the SiO_2 in 2.0 equiv. Burns were at cones 11, 14, and 17. The results are given in 6 charts. The limits for good glazes are much greater at the higher temp. Good glazes are (1) for 1.0 RO (0.5 KNaO, 0.5 CaO) at cone 11, 0.9 Al_2O_3, and 8.0 SiO_2; at cone 14, 1.05 Al_2O_3, 10.0 SiO_2; and at cone 17, 1.1 Al_2O_3, and 15.0 SiO_2. (2) For 1.0 RO (0.1 KNaO, 0.9 CaO), at cone 11, 0.7 Al_2O_3, 5.0 SiO_2; at cone 14, 0.95 Al_2O_3, 9.5 SiO_2; and at cone 17, 1.1 Al_2O_3 and 14.5 SiO_2. Suitable compn. of semi-mat and mat glazes are also discussed in detail. S. T. (*C. A.*)

Heavy Clay Products

68. The utilization of crude lignite for brick burning. Weizz and Becker. *Braunkohle*, **20**, 310–12(1921).—Whereas 180 kg. of hard coal are required to burn 1000 bricks, 500 kg. of dried lignite, such as Rhenish, are necessary. The utility and economy of lignite depend chiefly upon proximity to the source of supply. C. C. Davis (*C. A.*)

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69. Pottery; artificial stone. R. Tralls. Brit. 172,295, Nov. 25, 1921. Minerals contg. clay, lime, or iron and bituminous materials are smelted by means of their own combustible constituents in the production of castings. The minerals mentioned are various clays, lime formations, and iron oxides which are found in lignite and black coal swamps, turf or moor deposits, or independent deposits such as aluminite, oil schist and certain marls having bituminous constituents. The air dried materials are heated in a smelting furnace by the waste combustible gases until incandescent, when the combustible constituents complete the smelting. If necessary, a small proportion of coal, etc., may be added and a flux such as lime, gypsum, fluorspar, etc., introduced. For coloring and varying the quality of the casting, metals or metallic compds. are employed. (*C. A.*)

Glass

70. The effect of temperature upon the ultraviolet absorption of glasses. Walter Rieder. *Jahrb. Phil. Fak. II, Univ. Bern.*, **1**, 148–54(1921).—Twelve var. of glass were studied at temps. up to 450° and in one case down to the temp. of liquid air and with wave lengths down to 2250°. All var. exhibited a transmission limit below which the transmission for all shorter wave lengths was zero. Increase of temp. in all cases raised this transmission limit toward the region of longer wave lengths. The var. data are recorded in the author's thesis Ms. in 48 tables. The present paper is only an abs. E. W. W.

71. The interaction of silica, sodium oxide and barium oxide. Part XII of "The Development of Various Types of Glass." C. J. Peddle. *J. Soc. Glass Tech.*, **19**, 201–11(1921).—Two series of glasses were prepd. and studied. One series was based on mol. type 100 SiO_2, 40 Na_2O, x BaO, where x varied from 5 to 40 at intervals of 5, the other based on mol. type 100 SiO_2, 20 Na_2O, x BaO, where x varied from 5 to 40 at intervals of 5. The *density* and *refractive index* increase with an increase in barium oxide and also with an increase of sodium oxide, the increase for sodium oxide holding for d. when the mol. barium oxide content is less than 16 mols. and for refractive index when the content is less than 25 mols. Total *dispersion* increases with the addition of either barium or sodium oxide, the rate of increase being greatest in barium series containing the least sodium oxide. Most of the glasses tested did not have good weathering properties and were easily devitrified. W. C. Taylor

72. The interaction of silica, potassium oxide, and barium oxide. Part XIII of "The Development of Various Types of Glass." C. J. Peddle. *J. Soc. Glass Tech.*, **19**,

212–220(1921).—Two series of glasses similar to those in Part XII of this series except with K_2O instead of Na_2O, were prepd. and studied. It was found in these series that the *density, refractive index,* and total *dispersion* increase with increasing barium content and that the *solubility* decreases as the barium oxide content increases. All the glasses showed a tendency to *devitrification.* W. C. TAYLOR

73. The interaction of silica, barium oxide, and the oxides of sodium and potassium. Part XIV of "The Development of Various Types of Glass." C. J. PEDDLE. *J. Soc. Glass Tech.*, **19,** 220–28(1921).—Glasses of the mol. types 100 SiO_2, Na_2O, 20 K_2O and 100 SiO_2, 10 K_2O, 10 Na_2O, x BaO were investigated, x varying from 5 to 40 mols. As in the other series the *density, refractive index* and *total dispersion* increases as the proportion of barium oxide increases, the *solubility* increasing as the barium oxide content decreases. None of the glasses were of first class durability. W. C. TAYLOR

74. A comparison of the alkali-barium oxide-silica glasses. Part XV of "The Development of Various Types of Glass." C. J. PEDDLE. *J. Soc. Glass. Tech.*, **19,** 228–256(1921).—A long series of soda barium, potash barium and soda-potash barium silicates were studied. Statistics are given in regard to effect of compn. on *color, density, refractive index, dispersion, devitrification, form of crystals, solubility, durability,* and *pot attack,* and some general conclusions drawn. W. C. TAYLOR

75. A comparison of the alkali-barium silicate and alkali-lead silicate glasses. Part XVI of "The Development of Various Types of Glass." C. J. PEDDLE. *J. Soc. Glass Tech.*, **19,** 256–68(1921).—A comparison of the results obtained in the preceding papers on lead and barium glasses discussing the relative effects in regard to *density, refractive index, total dispersion, value, devitrification, solubility and durability.* W. C. TAYLOR

76. The shrinkage porosity and other properties of British fire-clay after being fired at high temperatures. EDITH M. FIRTH AND W. E. S. TURNER. *J. Soc. Glass Tech.*, **19,** 268–76(1921).—Detns. of the shrinkage, porosity, and apparent and real *specific gravities* of 26 British and 1 German clay were made at 1500°C. Ten of the clays including the German, undergo permanent linear expansion between 1400° and 1500°; seven including the German, undergo decrease of apparent sp. gr. and only two show appreciable increase of porosity; two of the clays underwent over-firing before 1500° and two developed blistering to a slight extent. (*Jour. Amer. Ceram. Soc.*, **4,** 68(1921)). W. C. TAYLOR

77. The density of glasses containing aluminum. S. ENGLISH AND W. E. S. TURNER. *J. Soc. Glass Tech.*, **19,** 277–80(1921).—Curves are given to show d. of *sodium-calcium, sodium-magnesium* and *sodium-aluminium silicates.* Although wt. for wt. 1% of magnesia, the substitution of alumina for lime or soda reduces the d. very considerably. Density factors are also discussed. W. C. TAYLOR

78. Measurement of the double refraction in tempered glass. TAFFIN. *Compt. rend.*, **173,** 1347–50(1921).—The double refraction in the strained glass is balanced by that caused in an annealed plate of glass under a variable load in a testing machine. E. D. WILLIAMSON (*C. A.*)

79. Polishing glass by means of acids. O. PARKERT. *Zentr. Baukeram.*, **35,** 1–2 (1920); *Chimie et industrie,* **6,** 631(1921).—The material to be polished is thoroughly cleansed by means of a 12% H_2SO_4 and 1% HCl bath. It is then immersed for 45 sec. in a bath consisting of 1 part water, 2 parts H_2SO_4, and 1 part HF, which is kept at 35°, and is then washed with water. If necessary the treatment is repeated. Fine glassware is sometimes rubbed with putty powder. A. P.-C. (*C. A.*)

80. Annealing of glass. E. D. WILLIAMSON. *J. Wash. Acad. Sci.*, **12,** 1–6(1921).—A mathematical discussion of the most rapid methods of annealing glass. Schedules are given for carrying out the process in a shorter time than has previously been used. E. D. WILLIAMSON (*C. A.*)

81. A novel leer installation. ANON. *Nat. Glass Budget*, **37**, No. 34, 14(1921).—The Columbia Glass Co. of Fairmont, W. Va., is trying out a small leer of steel and asbestos which requires no external heat for its operation. The newly made ware is introduced into it quickly and the excellent insulation of the leer conserves the original heat of the glass sufficiently to anneal it in $^3/_4$ of an hour. The chief difficulty, it is claimed, is the regulation of the heat to avoid melting the ware.
J. B. PATCH (*C. A.*)

82. Recommended specifications for limestone, quicklime, and hydrated lime for use in the manufacture of glass. ANON. The Bur. Standards, *Circ.*, No. **118**, 7 pp. (1921).—This is based on a draft originally prepared by A. E. Williams, of the Glass Section of the Bureau, and has been unanimously approved by a "conference" composed of representatives of the Geol. Survey, Bur. Mines, Bur. Soils, Bur. Chemistry, Forest Service, Fixed Nitrogen Research Lab., and The Chemical Warfare Service. It has also been "adopted as tentative by a majority vote of the Standardization Committee of the Glass Division of the Am. Ceramic Society." G. E. BARTON (*C. A.*)

PATENTS

83. Glass manufacture. T. B. KETSON. Brit. Pats. 170,882, 170,883, May 7, 1921. *Ill. Off. Jour. Pats.*, Dec. 21, 1921, p. 5707. Relates to bottle blowing machines, and ratchet gearing for same. With illus. WM. M. CLARK

84. Glass manufacture. PHILLIPS LAMP WORKS. Brit. Pat. Appl. 172,289. *Ill. Off. Jour.*, Jan. 25, 1922, p. 6223. Describes a process for drawing glass tubing or cane continuously from a supply of molten glass. The metal flows from a tank inside an inclined rotating cylindrical chamber, which is heated. Diagrams included.
WM. M. CLARK

85. Glass working. BRIT. THOMSON-HOUSTON CO. AND G. E. CO., Brit. Pat. 171,232, Sept. 3, 1920. *Ill. Off. Jour. Pats.*, Dec. 30, 1921, p. 5837. Describes a machine for flaring the ends of glass tubes, especially those used as parts in the manuf. of incandescent lamps. Sketched. WM. M. CLARK

86. Glass. E. W. ENEQUIST. U. S. 1,403,752, Jan. 17. Basic soda slag contg. ferrous Fe is used in glass together with sand and other glass-making materials to form a black glass adapted for use alone or as a glaze. (*C. A.*)

87. Glass manufacture. WESTINGHOUSE LAMP CO. Brit. 170,563, Sept. 15, 1921. Glass which will resist the action of the vapors of alkali metals in vapor elec. lamps is composed of a mixt. of oxides such as Na_2O 13, Al_2O_3 15, CaO 12, B_2O_3 60%. Such glass withstands temps. of 400-600° in Na vapor lamps. (*C. A.*)

88. Glass manufacture; electric insulation. P. SCHUDI-FREULER. Brit. 171,692, Nov. 15, 1921. Black glass, which is of use as an elec. insulating material, and which has a small thermal expansion, is made by melting a natural rock such as schist, consisting chiefly of quartz, lime, and Al_2O_3 and adding a further quantity of one or more of these substances until the melted product contains approx. 1 part of Al_2O_3, 1.65 parts CaO, and more than 3.56 parts of SiO_2, the amt. beyond 3.56 parts being calculated so that all other oxides present may be converted into silicates. The main ingredient of the finished product has the chemical formula $(SiO_2)_6.Al_2O_3.(CaO)_3$ and melts at about 1250°. (*C. A.*)

89. Electric glass-annealing furnace. O. A. COLBY. U. S. 1,401,674, Dec. 27. (*C. A.*)

Enamels

90. Enamels for tinware. ANON. *Taschenbuch für Keramiker, Keram. Rundschau*, 37–40(1922).—

TABLE I

GROUND COATS

	I Fritt	II Fritt	III Fritt	IV Fritt	V Fritt
Boric acid	0.0	0.0	0.0	0.0	240.0
Borax	371.0	32.0	44.0	374.0	115.0
Feldspar	333.0	28.0	31.0	335.0	96.0
Quartz	192.0	20.0	17.0	196.0	231.0
Calcined soda	45.0	6.0	3.0	56.0	0.0
Fluorspar	37.0	3.0	4.0	39.0	38.0
Whiting	0.0	9.0	0.0	0.0	0.0
Potassium nitrate	22.0	2.0	1.0	0.0	0.58
Manganese silicate	0.6	0.5	0.0	0.50	212.0
Cobalt oxide	0.3	0.2	0.1	0.25	0.0
Nickel oxide	0.0	0.0	0.1	0.0	0.0
Magnesia	0.0	0.0	0.0	0.0	10.0
	Mill mixt.	Mill mixt.		Mill mixt.	Mill mixt.
Fritt	94	92		94	90
Clay	6	8		6	10

TABLE II

WHITE ENAMEL

	I Fritt	II Fritt	III Fritt	IV Fritt	V Fritt	VI Fritt
Feldspar	386.0	0.0	220.0	235.0	353.0	32.0
Quartz	190.0	297.0	175.0	314.0	205.0	8.0
Borax	154.0	229.0	300.0	162.0	168.0	26.0
Calcined soda	0.0	117.0	135.0	93.0	0.0	9.0
Cryolite	117.0	0.0	0.0	157.0	120.0	5.0
Potassium nitrate	65.0	80.0	20.0	31.0	64.0	3.0
Whiting	65.0	0.0	0.0	0.0	70.0	0.0
Fluorspar	13.0	0.0	0.0	0.0	20.0	6.0
Magnesite	10.0	0.0	0.0	0.0	0.0	0.0
Magnesia	0.0	37.0	0.0	8.0	0.0	0.0
Tin Oxide	0.0	240.0	150.0	0.0	0.0	11.0
	Mill mixt.	Mill mixt.		Mill mixt.	Mill mixt.	Mill mixt.
Fritt	84.0	94.0		90	85	86
Tin Oxide	10.0	2.0		6	10	8
Quartz	0.0	4.0		0	0	0
Clay	6.0	0.0		4	5	6

Colored enamels are obtained by the addition of the foll. ingredients. *Violet:* Manganese silicate; *Green:* Copper oxide with or without iron oxide or chromium oxide. With the last oxides one obtains only a translucent green, since tin oxide produces a pink tinge. Cryolite also spoils the green color. *Brown:* Iron oxide or manganese silicate; *Gray:* Nickel oxide or iron scale; *Black:* Cobalt oxide and manganese silicate; *Red:* For a cheap red, iron sulphate is calcined with alumina until the body takes a good red color. This color is then added to the enamel in a predetermined amount. Cadmium selenide and copper oxide and gold produce good red colors; *Rose:* Manganese oxide; *Orange:* Red ochre. H. G. SCHURECHT

91. Operating costs of electric furnace for baking vitreous enamel. ANON. *Elec.*

World, **79**, 286(1922); 1 illus.—Production was increased and costs were reduced by substituting elec. for oil-fired enameling furnaces. Detailed figures are given.
C. G. F. (*C. A.*)

92. Electric enameling oven. E. KRAMER. *J. Elec. Western Ind.*, **48**, 114(1922); 1 illus.—Details of construction and operation of an automatic oven enameling 40 lbs. of metal per kw. hr. C. G. F. (*C. A.*)

Cement, Lime and Plaster

93. Contribution to the knowledge of the processes which occur during the formation of mortars. AUGUST ZELLWEGER. *Lab. Anorg. Chem. Bern. Jahrb. Phil. Fak., II, Univ. Bern.*, **1**, 102–106(1921).—*Sedimentation experiments.* The oxides CaO, MgO, and CaO were separately treated with an excess of water or of solutions of electrolytes and the velocity of slime deposition measured. The influence of the various ions was in general the same for the different oxides and seemed to be determined largely by the colloidal condition of the oxide. The phenomena of adsorption and swelling apparently were involved in the behavior shown.

MgO volume changes. The volume changes which accompany the slaking of MgO were studied dilatometrically. An initial expansion followed by a subsequent contraction was observed. The relative influences of various salts upon the expansion were the same as in the sedimentation expts. The final contraction was not affected by electrolytes.

The hardening of MgO slime. The influences of various electrolytes were in the same order as in the preceding experiments.

Conclusions. Colloidal swelling is the first step in the slaking process and colloidal processes are responsible for the various phenomena which accompany slaking.
E. W. W.

94. Accelerated test of portland cement. S. KANOH. *J. Chem. Ind.* (Japan), **24**, 675–99(1921).—Different methods now in use for accelerated tests are classified. The test for strength is as important as the test for constancy of vol. when the test is to ascertain the quality of the cement in a short period. Comparison of strength, expansion, and degree of hydration of 2 cements at 97–8°, and also at room temp. (8–13° and 11–18°) showed that hydration and hardening are remarkably accelerated by rise of temp. The results obtained by other investigators from strength test may be due to the irregularities to their tensile tests, in which the strength retrogression in course of hardening in longer period may not be the indicator of the true characteristic of the cement, but may be the result of eccentric loading, to which the tensile briquets are subjected. The accelerated tests for strength should be made not for tensile, but for compressive strength of mortar of cement and sand. Twelve charts and 7 tables are given to show the detailed results. S. T. (*C. A.*)

95. A new hydraulic magnesium cement. A. CH. VOURNAZOS. *Compt. rend.*, **172**, 1578–80(1921).—Hydraulic cement can be made from Greek magnesite if it is burned at a temp. only just high enough to expel the CO_2 and then mixed with amorphous silica or some substance contg. it, *e. g.*, pumice, pozzuolana or volcanic ash. The ratio should be 2 MgO : SiO_2 (amorphous). Pumice from Santorin contains 65% of SiO_2, of which 18/65 is amorphous (sol. in dil. KOH). The pumice has also 15% Al_2O_3 and 3% CaO. The rest is Fe_2O_3, TiO_2, MnO_2, MgO and alkalies. Greek (Euboean) magnesite is calcined without vitrifying. The rise of temp. is checked at the CO_2 expulsion point and the heating continued at that level. The product is ground to 80-mesh and stored. When mixed with fine pumice or pozzuolana and water, setting takes place in 48 hrs. in air or 90 in water: hardening continues for more than a year. 100 parts of pumice, contg. 18% amorphous SiO_2, require 24 parts of pure MgO or 30 parts of calcined Greek magnesite. The pumice is ground to pass 60-mesh. 35 parts of sand

are added if contraction strains are to be avoided. This mixt., after gaging with water and hammering into molds, shows strength as follows in kg. per sq. cm. ($\times$ 14.48 = lbs. per sq. in.).

	Air		Water	
	Tensile	Crushing	Tensile	Crushing
7 days	6.50	81	5.40	65
28 days	9.25	105	7.00	72
3 months	14.50	144	10.75	98
6 months	18.50	181	14.20	118
12 months	21.20	201	17.75	141

Max. strength is not then reached. Mortars are unchanged in appearance. Color is gray and grain is fine. They take paint well and may be used for interior or for exterior walls. They attack iron less than portland cement mortar does and their coeff. of expansion is almost that of iron. This magnesian cement is well suited for use in reinforced concrete. A pure white imitation marble, etc., may be made from 100 parts calcined magnesite, 60 parts amorphous SiO_2 and 70 parts of 30-mesh quartz sand. It sets in 40 hrs. It is unalterable like the pumice cement but no stronger. It is called "Leucociment." J. O. Handy (*C. A.*)

96. Acid-proof cements and stone. Theo. Utzel. *Chem.-Ztg.*, **45**, 1069–70(1921). —Cements based on water-glass are used extensively in the chem. industry. In H_2SO_4 plants they are used for luting the joints of monte-jus and for setting tiles in the denitrating towers. Because such cements harden quickly at the surface but only very slowly inside, they are often forced out by pressure before complete setting. Setting can be hastened by application of dil. HCl or H_2SO_4 to the cement in the joint. Even then, the inner part of the cement may not be affected. If more porous tiles are used the cement hardens better. German patent 784,111 relates to a process for making acid-proof stone. Jas. O. Handy (*C. A.*)

97. The protection of concrete and cement against the action of sulfates by means of barium carbonate. H. Nitzche. *Cement*, **10**, 1–2, 13–5(1921); *Chimie et industrie* **6**, 799(1921).—N. considers that after all the $BaCO_3$ has reacted with the sulfates, the action of further quantities of sulfates takes place quite readily. The reaction $BaCO_3 + CaSO_4 = BaSO_4 + CaCO_3$ is probably not the only one, and other reactions and accessory phys. phenomena probably come into play. Mortars to which no $BaCO_3$ had been added behaved very well, both when immersed in sulfate-bearing waters and when exposed to the atm. for 4 weeks, while all the samples treated with $BaCO_3$ behaved abnormally to varying degrees. A. P.-C. (*C. A.*)

98. The chemical composition of cement. D. I. Bujor. *Contrib. Stub. Compoz. Chim. Ciment*, **1920**, 5–18; *Chimie et industrie*, **6**, 799(1921).—During the calcination of a mixt. of clay and limestone at 1200–1700° the partial fusion of SiO_2, Al_2O_3, Fe_2O_3, CaO and MgO gives rise to a semi-fluid soln. which reaches a state of mol. equil. SiO_2, Al_2O_3 and Fe_2O_3 are equiv. and constitute the acid portion, while CaO and MgO are equiv. and constitute the basic portion. Within the limits of the chem. equil. the proportions of acid constituents can vary rather widely, while the basic constituents vary within very narrow limits. The equil. in the semi-fluid soln. is represented by $(SiO_2 + Al_2O_3 + Fe_2O_3) : 2.34\ (CaO + MgO)$. On cooling it solidifies completely forming pure cement. Below 1200° the proportion of pure cement is lower, part of the $CaCO_3$ being undecomposed or remaining as free CaO and part of the clay being mixed with the cement as insol. silicates. Above 1700° CaO and the excess of SiO_2 form silicates low in CaO which do not set with water. A. P.-C. (*C. A.*)

99. Researches with blast-furnace slags. H. Burchartz. *Mitt. Materialprüfungsamt*, **38**, 149–63(1921); cf. *Ceram. Abs.*, **5**, 50(1922).—This is the 3d and final report to the Commission for the Investigation of the Suitability of Blast-furnace Slag for Con-

crete. Previous tests at Heligoland had not shown durability in sea water but the mixt. had been lean. The new tests lasted 3 years and were carried on with concrete made in one case with portland cement and in the other with iron portland. The slag sand and coarser sizes were carefully graded to obtain max. d. Check samples were made up with no slag but with Rhine sand and gravel. Slags from several sources were tried. Steel reënforcement, clean, rusty or scale covered were embedded. All of these metal samples were free from rust in a short time and none became rusty later, the samples having been perfectly protected from both air and sea water for 3 years. This was true also of the sand and gravel concrete. The d. of concrete controls its durability in sea water. The mixts. were 1 part cement, 2 parts slag-sand and 3 parts coarser slag. The slag-sand varied from 1 to 7 mm., the coarser slag from 7 to 25 mm. and from 25–40 mm., the latter forming $^2/_3$ of the coarser slag. After 3 yrs. the concrete made with iron portland cement was 9% stronger than the portland in the case of the slag mixt. and 6% in the sand and gravel one. Slag concrete from portland cement was 5% and from iron portland it was 8% stronger than sand and gravel concrete. JAS. O. HANDY (*C. A.*)

100. Relation between the clay content and certain physical properties of soil. B. A. KEEN AND H. RACZKOWSKI. *J. Agric. Sci.*, **11**, 441–49(1921).—A simple process for determining the following physical properties of soils is described: Apparent specific gravity, water taken up by unit volume of soil, pore space, specific gravity, volume expansion of soil when saturated with water. The specific gravity and apparent specific gravity vary inversely, and the absorptive power for water, the pore space, and the volume expansion of the saturated soil vary directly with the percentage of clay in the soil. The effect of organic matter on the constants mentioned is approximately the same, weight for weight, as that of clay. A. G. P. (*Jour. Chem. Ind.*)

101. Flocculation of soils. II. N. M. COMBER. *J. Agric. Sci.*, **11**, 450–471(1921). (Cf. J., 1920, 793 A).—The clay particle is assumed to consist of a central core surrounded by an emulsoid protective layer, and coagulation may result in three ways. "Normal" flocculation, as by salts of iron and aluminium, is precisely similar to the coagulation of electro-negative suspensoids by electrolytes. "Indirect" flocculation results from interaction between the flocculant and the constituents of the clay particle, whereby normal flocculants are produced. The action of some neutral salts and acids is of this type. "Abnormal" flocculation, as in the case of lime, is due to a reaction between the flocculant and the emulsoid surface layer of the particle. Although the flocculating effects of calcium hydroxide are reversible to carbon dioxide, the formation of calcium carbonate is not an essential part of the process. The hydroxyl ion may function in two ways in conjunction with the calcium ion. If added with or after the calcium ion, it produces the necessary alkalinity for the reaction between calcium salts and silica, etc. but if added before the calcium, the emulsoid surface of the clay is peptised and flocculation becomes more rapid and the volume of the coagulum greater. The difference in the action of lime on clay and on silt particles depends only on the relative proportions of emulsoid surface and core of the particle. A. G. P. (*Jour. Chem. Ind.*)

PATENTS

102. Cement composition. H. RICH. U. S. 1,404,060, Jan. 17. A mixt. adapted for road surfacing or brick making is formed of finely ground portland cement and clay together about 32, earthy material about 64 and finely powdered glass, SiO_2 or other similar hard material about 1–5 parts. KNO_3, S and creosote may be added. (*C. A.*)

103. Potash and white cement. A. C. AUGEN. Can. 213,611, Oct. 4, 1921. Mineral-contg. silicates of Fe and K are roasted with lime and salt, the coarser parts are sieved out and reground and the whole is treated under pressure in a closed vessel with steam and hot water to wash out the K. The water is sepd. from the solid matter, which is mixed with lime and roasted to produce white cement. (*C. A.*)

104. Kiln for burning lime or cement. J. H. Lemmon. U. S. 1,401,481, Dec. 27. The kiln has a central bridge wall spaced to allow for expansion and provided with gas supply flues. (*C. A.*)

105. Cold glaze for cement. K. Friedrich. U. S. 1,402,412, Jan. 3. A cold glaze for cement or other building materials is prepd. by mixing a finely sifted sand-free colored cement with an aq. emulsion of derivs. obtained by oxidizing bituminous material in the presence of alkalies and free from volatile oils. (*C. A.*)

106. Cements. Bombrini Parodi-Delfino. Brit. 170,063, July 5, 1920. A slow-setting cement free from Ca aluminates and ferrites is prepd. by adding Fe_2O_3 to the usual ingredients of portland cement, so that the ratio of Fe_2O_3 to Al_2O_3 is between 1 and 1.563 to 1. Siliceous sand is also added to restore the ratio of SiO_2 to sesquioxides to the normal value. The materials are treated in the usual manner. (*C. A.*)

107. Manufacture of earthenware. C. E. Fulton. U. S. 1,398,014, 22.11.21. Appl., June 7, 1919. Material for the manufacture of clay goods is treated with a mixture of an alkali hydroxide, a soluble alkali silicate, and a deflocculating agent of the nature of gallic acid. C. A. K. (*Jour. Chem. Ind.*)

BOOK REVIEWS

Fluidity and Plasticity. Eugene C. Bingham, Ph.D. International Chemical Series. pp. x + 440 + 96 figures. McGraw-Hill Book Company, New York, 1922.

Bingham after many years of careful and painstaking experimentation in the field of plastics has finally brought out a work that will prove to be a standard of reference in a nearly virgin field.

The author develops and clarifies the laws of flow in a way to suit the mathematically as well as the experimentally inclined. He neither sidesteps mathematical derivation of formulae where necessary, nor does he fail to give consideration to the more technical aspects of flow.

The laws of flow as related to gases, liquids, solutions, suspensions and solids are up in order in the first few chapters and applications of the same to technical processes are made in the latter half of the book.

The arrangement of the text is excellent. A summary of the fundamental considerations in a few of the chapters is given. It is so thorough that one feels that this could have well been continued throughout the text.

Not of least value are the appendix and index, which latter takes the form of a very complete bibliography. The appendix contains sections of practical viscometry and plastometry, technical viscometers and some valuable tables.

The book is vital to ceramic research and technology. It is hardly fair to commend one chapter above another but those of more vital interest to the ceramic man are "Viscosity and Fluidity," "Colloidal Solutions," "Plasticity of Solids," "Lubrication" together with the appendix above mentioned.

After a careful examination of the book one can not but feel that a wide gap in our literature has been adequately filled. G. A. Bole

Zirconium and Its Compounds. Francis P. Venable. American Chemical Monograph Series. Pp. 169. The Chemical Catalog Company, Inc., New York, 1922.

A thorough compendium of this subject. The book takes up the history, the reduction and properties of the metal, and the compounds of the various classes in an orderly way. It closes with analytical methods and technical applications. Then follows a complete list of patents with abstracts of each and a complete bibliography. In this the author's twenty original contributions deservedly shine. The text is replete with references. The presswork and binding are excellent. F. G. Jackson

CERAMIC ABSTRACTS

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General and Miscellaneous

1. Experiments with heat interchangers. F. R. Bichowsky. *J. Ind. Eng. Chem.*, **14,** 62–64(1922).—In liquid air machines and other refrigerators the loss of efficiency due to poor thermal insulation ordinarily is small compared with that due to poor interchange. The efficiency of heat interchange was studied by means of an apparatus consisting of a gas-conducting tube, 0.124 in. in internal diam., through which was stretched centrally a wire of No. 40 constantan. Leads of No. 40 copper wire were connected with the ends and the middle of the constantan wire, the whole forming a differential thermoelement giving the temperature of the gas at these points. The tube was immersed in a bath of liquid air. The temperature drop per unit length of tube was independent of the pressure, inversely proportional to the rate of flow of gas through the tube, and proportional to the temperature head from bath to incoming gas. A formula is given by which it is possible to calculate the length of tubing necessary for an ideal interchanger of given thermal efficiency. The results accord with practice in interchangers of the best design. Liquefiers of copper tube, flattened, and twisted to enable it to stand high pressure without bulging, may give an efficiency of 70% of theory.

H. M. (*Jour. Chem. Ind.*)

2. Burning of pulverized fuel in paper mill power plants. Loren L. Hebberd. *Tech. Assoc. Papers,* **4,** No. 1, 13–21(1921).—A general exposition of the advantages of using pulverized fuel in paper mill power plants, both in new mills and in old mills at present operating with stokers, with estimates of costs and savings. Discussion.

A. P.-C. (*C. A.*)

3. Volumetric and gravimetric methods for the determination of zinc in practice. Stefan Urbasch. *Chem.-Ztg.*, **46,** 6–7, 29–30, 53–5(1922).—In these 3 installments, the treatment of Zn ores, the effect of impurities, and details concerning titration with $K_4Fe(CN)_6$ are discussed and the results of certain test analyses are given. To dissolve the ore, treatment with about 20 cc. of 12 *N* HCl, 1 cc. of concd. HNO_3 and enough HF to react with SiO_2 is recommended, after which the soln. is evapd. to fumes with 7 cc. H_2SO_4. To remove metals of the Cu group, treatment with H_2S appears to be indispensable. Fe, Mn and Al are best removed by treatment with Br and the presence of a suitable concn. of NH_4OH and NH_4Cl. The removal of Al is shown to be necessary and the effect of NH_4 salt is noticeable, but best compensated by standardizing with the same concn. as in the analysis. Instead of using an outside indicator, it is better to add about 0.2 mg. of Fe to the soln. in the form of $FeCl_3$ and then, in the hot soln., the endpoint is reached when the color changes from pale blue to white or pale yellow. It is well to add a slight excess of ferrocyanide and titrate back with standard Zn soln. The ferrocyanide soln. will keep indefinitely if kept in contact with H_2. W. T. H. (*C. A.*)

4. A new method for the detection and estimation of cobalt. S. A. Braley and F. B. Hobart. *J. Am. Chem. Soc.*, **43**, 482–4(1921).—A brown color is always obtained when a soln. contg. Co is treated with dimethyl glyoxime and the color does not disappear, as does that of most oximes, upon the addn. of mineral acids. This color reaction may be used as a test for Co in the absence of interfering substances such as Cu and Fe and as a basis for the colorimetric detn. of Co. W. T. H. (*C. A.*)

5. Activity coefficients and colligative properties of electrolytes. H. S. Harned. *J. Am. Chem. Soc.*, **44**, 252–67(1922).—On the basis of an empirical equation $\log F_a = \alpha c - \beta c^m$ which relates the activity coeff. (F_a) of an electrolyte with the mol. concn. (c) at a given temp. (α, β and m being consts.) and Duhem's equation, $N_1 d\alpha F_1 = -N_2 d\alpha F_2$, where N_1, N_2, F_1 and F_2 are mol. fractions and free energies of the electrolyte and water, equations are derived for calcg. vapor pressures of solns. In all the 13 electrolytes studied the empirical equation holds up to $3M$, above which the equation fails for H_2SO_4 and HCl. A special study of the activity coeffs. of KCl, NaCl and HCl was made and the parameters (α, β and m) for the 13 electrolytes were tabulated, from which the vapor pressures and osmotic pressures can be calcd. The equation, admittedly empirical, should prove useful in testing existing data and in organizing colligative data of concd. solns. James M. Bell (*C. A.*)

6. Patent legislation and the chemical industry. André Taillefer. *Chimie & industrie*, **6**, 845–7(1921).—Discussion of process patents and product patents. A. P.-C. (*C. A.*)

7. The phenomena of layer formation in clay suspensions and their application to soil analysis. E. Ungerer. *Kolloidchem. Beihefte*, **14**, 63–96(1921).—The literature is reviewed. Expts. were conducted with centrifuged suspensions of ultramarine blue and ultramarine red, as well as by settling under the influence of gravity. Samples were removed from each distinct layer of the suspension, and the no. of particles counted. The size of the particles was also calcd. from the Stokes equation (size of particles expressed as function of velocity of settling, viscosity of the medium, d. of particles, d. of medium). Observed and calcd. values agree well. Emulsions (gum arabic, oil and H_2O) exhibit the same phenomena. To det. the conditions for the formation of layers, the size and d. of the individual particles must be considered; each sep. layer indicates particles of definite size. Different strata indicate definite differences in wt. and size of the particles. Each layer reaches to the bottom of the contg. vessel. Const. temp. conditions influence largely the formation of definite strata of turbidity. The layers are formed equally well in suspensions contg. electrolytes and in those which are electrolyte-free, excepting electrolytes with marked coagulating power. The particles of each stratum sink (or rise) with equal velocity. From the velocity of falling (or rising) with the help of the *Stokes equation* one can establish the characteristic size of each group in contact with solid surfaces, and are not due to higher free energy content of atoms in nascent state because when mols. are dissociated by heat the resulting atoms show no properties, save those arising from increase in number, not already shown by the undissociated mols. By causing H to bubble in a soln. through a filter paper extn. thimble, Z. found a soln. of $HgCl_2$ was appreciably reduced. Similarly O oxidized NH_3 to HNO_2 and N and H united sufficiently to give a reaction with Nessler's reagent. J. C. (*C. A.*)

8. Molecular structure of amorphous solids. C. V. Raman. *Nature*, **109**, 138–9 (1922).—The magnitude of the scattering of a beam of light by glass lends support to the view that the arrangement of the mols. is irregular rather than that they are packed together at more or less uniform distances apart as in crystals. W. H. R. (*C. A.*)

9. Research laboratories in industrial establishments of the United States, including consulting research laboratories. A. D. Flinn and Ruth Cobb. *Bull. Natl. Research Council*, **3**, Pt. 1, 1–135(1921). E. J. C. (*C. A.*)

10. Fuller's earth deposit at Olmstead, Ill. C. W. Parmelee. *Chem. Met. Eng.*, **26,** 177(1922).—Fuller's earth is being mined at Olmstead, Ill. for use in the bleaching of oils. The total amt. available is estd. at 4 million tons, and its advantageous location will probably make it comp. important. Edw. F. Holden (*C. A.*)

11. Centrifugal decantation. R. Berline. *Chimie & industrie*, **6,** 737–45(1921).—An outline of the theory of centrifugal decantation with a brief description of various types of comp. app. A. P.-C. (*C. A.*)

12. Industrial research and patents. C. L. Jenks. *Chem. Met. Eng.*, **26,** 394–7 (1922). E. H. (*C. A.*)

13. Corrosion of a producer-gas cooling system. Lloyd E. Jackson. *Chem. Met. Eng.*, **26,** 60–4(1922).—The system consisted of dust catchers, collecting mains and condensers, into all of which cooling water was sprayed. The water was caught in a decanter, pumped 550 ft. to spray ponds, passed through a coke filter and pumped back through the system. Make-up water was added from the Providence city mains. After 6 mos. operation leaks appeared, especially in the 550 ft. main to the spray pond. The hot water in this main was acid and contained suspended coke dust. Tests showed that while the life of this 6 in. main under corrosion alone would be 10 yrs., erosion from the coke dust reduced it to 9 mos. Remedies suggested were: (1) To use fresh cooling water from wells and waste it into the bay after it went through the system once. (2) To use brackish water from the bay in the same way. (3) To recirculate fresh cooling water after filtering out the coke dust and treating with lime for acidity and with iron turnings for dissolved O. The results of numerous expts. are given and the suggested remedies discussed, but there is given no final conclusion as to which remedy was or should be adopted. J. J. Morgan (*C. A.*)

14. The Santa Barbara 500-ton mill for concentrating lead carbonate ores. F. M. Heidelberg. *Eng. Mining J.*, **112,** 1050–7(1921).—A description of the new mill of the American Smelters Securities Co. at Santa Barbara, Chihuahua, Mexico, with flow sheets and detailed data on equipment. Au and Ag are present in small but paying amt. A. Butts (*C. A.*)

15. Comparison between laboratory fuel tests and practical working results of the producer-gas process. N. E. Rambush. *J. Soc. Chem. Ind.*, **40,** 293–300T(1921); cf. *C. A.*, **15,** 2981.—R. describes a method and app. for detg. in the lab. the practical tar yield of fuels and gives the results obtained on the same fuel in the lab. and on large-scale gasification. The ordinary fuel analysis, especially in regard to the volatile content detn., is generally insufficient to predict the gasification products. Such a process as the one described should predict with reasonable accuracy the thermal efficiency, the quality of the gas, the possible yield of by-products such as tar and NH_3 from particular coals, as well as the type of plant to be employed. The app. consists primarily of a simple horizontal distn. retort with a condensation and absorption train. Two kg. of fuel are distd. gradually up to 800° from 4–6 hr. and the amt. and compn. of the distillate detd. by the usual methods. Data from a no. of expts. are given and compared with results obtained on actual producer plants and the relationship is shown to be very close. It is concluded that a tar recovery, in practice, of 80% could be obtained, and also it should be possible to det. the heating value of the gas from a particular coal by observing the relation between the coke gasification efficiency and the gas heating value. Fuels of fine grading require large gasification areas, and those of high-caking properties to be stirred mechanically, those of high ash content mech. grates, while those of high tar yield should be gasified at low temps. to give the highest yield of light tar oils, and those with high moisture content require a deep fuel bed in order to properly utilize the sensible heat of the gases. Fuels with high volatile content show thermal decompn. upon distn., such heat would, however, not be lost for the purpose of producer-gas production. J. L. Wiley (*C. A.*)

16. Twenty-eighth annual report of the Committee on Atomic Weights. Determinations published during 1921. G. P. Baxter. *J. Am. Chem. Soc.*, **44**, 427–37(1922); cf. *C. A.*, **15**, 1095.—Detns. on B, O, F, Cl, Ni, Zn, Ge, Cd, Sb, La and Bi are reviewed. E. J. C. (*C. A.*)

17. Investment in chemical education in the United States, 1920–1921. C. J. West and Callie Hull. *J. Ind. Eng. Chem.*, **14**, 237(1922). E. J. C. (*C. A.*)

18. Auxiliary electrochemical developments for hydroelectric plants. H. K. Benson. *Chem. Met. Eng.*, **25**, 1004(1921).—Of the chem. processes utilizing elec. power only a few are capable of operating intermittently on the off-peak power of a municipal hydroelec. plant. As a means for increasing the load factor of the new Skagit power plant at Seattle, Wash., the following process are preferred in the order given: the elec. are fixation of N; the electrochem. production of P_2O_5; the production of electrolytic H and O (in the event of the nearby location of a hydrogenation industry this process would rank second if not first); the production of NaOH or org. chemicals.

Louis Jordan (*C. A.*)

PATENTS

19. Ceramic vessel. Frederick S. Lowry. U. S. 1,400,489, Dec. 13, 1921. A ceramic vessel consisting of a body structure composed of compositely united inner and outer layers; the outer layer is composed of a mixt. of fire-clay, sand, manganese, and water suitably molded into receptacle form; the interior layer is composed of fire-clay, and water, the inner layer serving to impart a smooth finish to the interior of the vessel so that a glaze may be applied thereto. C. M. Saeger, Jr.

20. Condenser for shale-oil, etc. J. A. Bishop. U. S. 1,395,898, Nov. 1. Vapor to be condensed is passed through staggered vertical pipes cooled by air passed horizontally around them. The air is cooled by contact with H_2O-cooled brick walls. (*C. A.*)

21. Plastic composition and process for making the same. Reiman G. Erwin. U. S. 1,409,088, March 7, 1922. A compn. of matter comprising mineral dust of colloidal nature suspended in bitumen and combined with sodium chloride, sodium sulphate and sulfur derivatives in the following propns.: of dust and the above mentioned chemicals 40 to 60%, of bitumen 40 to 60% and an aggregate comprising mineral particles; 40 to 60% of such aggregate are suspended in from 60 to 40% of the bituminous compn. C. M. Saeger, Jr.

22. Plastic-block mold. Ernest John Benson. U. S. 1,408,685, March 7, 1922. A block mold comprising a rear end wall; side walls hingedly connected to the rear end wall for outward swinging movement; groove-forming members secured to the confronting sides of the side walls and each comprising a flexible tubular member; a rod for securing the member in position upon the wall; a front end wall detachably secured to and spanning the side walls; duct forming members secured to the inner sides of the front end wall, each of these comprising a core and a jacket embracing the core. C. M. Saeger, Jr.

Apparatus and Instruments

23. Apparatus for electrically heating liquid and solid chemicals. Anon. *Engineering*, **92**, 852(1921).—In a resistance type of heater, an a. c. is passed through the liquid to be heated, which flows down a cascade or step-ladder effect. The heat is controlled by alteration of the cross-section or length of the stream, or of the applied voltage; single- or 3-phase current may be used. Solid chemicals may be heated in an induction type of app., in which coils carrying an a. c. are arranged in such a relation to the surface with which the chemical is in contact that the induced current and hysteresis effect in it generate the necessary heat; temp. control is effected by regulation of the current.

This latter app. has been applied to rotary and drum driers, shelf driers, hot grinding pans, pumps, and delivery pipes. T. S. CARSWELL (*C. A.*)

24. Recessed plate and plate and frame filter presses: their construction and use. E. A. ALLIOTT. *J. Soc. Chem. Ind.*, **39**, 261–85T(1920).—This paper gives a detailed study of the construction and meaning of the many variations in type of filter presses, their use and data incident to operation including large scale operation figures. A given material varies greatly in filtering qualities because of slight variations in mfg. processes. The problem is hence very difficult and diverse. In the recessed plate press, the rims of the plate are raised so that a hollow chamber is formed when 2 plates are brought together. The feed passage is through the body of the plate and cloth is laid over each side. This type is the least expensive and requires less labor. It is suitable for cakes from 1 to 2 ins., depending on the size of the press. The second type of press is especially suited to the formation of very thick filter cakes or for filtering materials that tend to rot the cloth, for the plates are flat, the chambers being formed by placing hollow frames between the plates and the cloth therefore lies flat on the plates. In this press, filter paper can also be used. This type is not suitable for thin cakes or lumpy material because the feed openings which are through the rims of the frames are often very small. The plates of filters may be made of wood, iron, vulcanite (for strong HCl), etc. The best woods for strong acids are coniferous. Oak is best for CH_3COOH. Impregnation of the wood is of doubtful value as far as increasing its resistance to acids. Cocks are preferable to valves which, if used, should be of a kind easily cleaned. Small batches may be filtered in a large press by making use of a dead plate. The simplest closing gear (center screw pattern) is the most satisfactory. A. gives special facilities for the care of the cloth and advises the use of a pulp cake for filtering liquors contg. small quantities of fine ppt. For recessed plate type, double cloths are used and various methods of application of the cloth to the press are detailed. The design of the filter press depends upon a number of factors, chief among which are: quantity to be filtered, chem. properties, suitable cake thickness, working pressures, cloth, time required or rate, size of particle, etc. Tests on a small scale are run to get basic data. All of these factors are taken up mathematically, formulas being derived and curves being drawn covering not only the design and proper working and operation, but also the feed and washing and economical aspects including labor. The paper is exceptionally clear and detailed and is profusely illustrated with drawings, photographs, and photomicrographs. P. D. V. MANNING (*C. A.*)

25. Electric heat for thermal processes. E. F. COLLINS. *J. Ind. Eng. Chem.*, **14**, 101–4(1922).—An oven for baking automobile engine cores gave an efficiency of 11.6 lbs. of cores per kw.-hr. Japanning ovens are in use requiring over 3000 kw. to heat and turning out one automobile per min. Electrically heated glass annealing ovens show 20% lower cost than gas-heated lehrs. The muffled arc type of elec. furnace will melt 1500 lbs. of brass per hr., with a metal loss of less than 1.5% and a power consumption of not more than 270 kw.-hrs. per ton. Cu is melted at the rate of 1300 lbs. per hr. at 350 kw.-hrs. per ton. Other applications are in baking vitreous enamels, cartridge unit-heaters and glue melting pots. Also in *Beama*, **10**, Pt. 2, 3–25(1921). A. C. LANGMUIR (*C. A.*)

26. New Brown cold junction compensated pyrometer. ANON. *Chem. Met. Eng.*, **25**, 757–8(1921).—The cold junction of the thermocouple is brought to the pyrometer box; a Briguet spiral (compound strip of 2 metals of different coeffs. of expansion) is mounted on the moving member so that as the reading due to the difference between the temp. of the two junctions decreases with increasing temp. of the cold junction, the zero reading of the pointer is advanced. In this way the true temp. reading is obtained irrespective of the temp. of the cold junction. A smaller pointer actuated

directly by the Briguet spiral establishes the zero point of the instrument to allow resetting when necessitated by jars or by long service. DONALD W. MACARDLE (*C. A.*)

27. Setting a recording pyrometer for cold-junction temperature. KIRTLAND MARSH. New Kensington, Pa. *Chem. Met. Eng.*, **24,** 1152(1921).—In the case where the galvanometer scale does not come down to the cold-junction temp., the pointer is set for any convenient low temp., A, then, by an adjustable small e. m. f., is deflected by an amt. $A - C$, where C is the cold-junction temp., and then set to A while the small e. m. f. continues to be applied. On open circuit the pointer, though off scale, now reads C, which is the necessary adjustment. W. P. WHITE (*C. A.*)

28. Pyrometry. Color temperature and brightness of various illuminants. E. P. HYDE AND W. E. FORSYTHE. *Trans. I. E. S.*, **16,** No. 8, 419–30(1921).—Color temps. for many light sources are given including:

Gas flame—batswing	2160°C
Gas flame candle shape	1875
Sperm candle	1930
Paraffin candle	1925
Standard Pentane Lamp 10 C. P.	1920
Flat wick kerosene lamp	2055
Round wick kerosene lamp	1920
4. w. p. c. carbon	2080
3.1 w. p. c. treated carbon	2165
2. w. p. c. osmium	2185
2. w. p. c. tantalum	2260
Acetylene as a whole	2380
One spot acetylene	2465
Mees burner	2360
1.25 w. p. c. tungsten	2400
2.3 w. p. c. Nernst	2400
Sun outside atmosphere	6500
Sun at earth's surface	5600

WM. M. CLARK

PATENTS

29. Drying apparatus. M. MOMOTANI. Jap. 37,903, Jan. 26, 1921. A conical vessel, in which spiral stairs are fixed, is provided with an elec. heater and drier for air. Materials are charged from the top; dried air is introduced from the bottom. (*C. A.*)

30. Viscosimeter. H. N. MOODY. U. S. 1,405,538, Feb. 7. (*C. A.*)

31. Gas-analysis apparatus. E. H. DELANY AND S. H. PAYNE. U. S. 1,395,560, Nov. 1. Gas to be tested, *e. g.*, flue gases for CO_2 detn., are passed into a liquid absorbent such as NaOH soln. in a tower provided at its top with gages for registering differences in pressure caused by the absorption. (*C. A.*)

32. Thermocouple. M. A. HUNTER. U. S. 1,393,375, Oct. 11. A thermocouple is formed of 2 elements producing, when heated, or cooled, a substantially linear e. m. f.-temp. curve; one of the elements is an alloy of Cu 50–75, Ni 50–25 and Cr 5–30 parts which is refractory and highly resistant to oxidation and the other element is an alloy of Ni 100 with Cr 10 parts. (*C. A.*)

Chemistry, Physics and Geology

33. Brick testing by the Brinnel Ball Method of Le Chatelier and Bogitch. *Rev. Mat. Constr. Trav. Pub.*, **147,** 240(1921).—(Read before the French and Belgian members of the I. A. T. M. by Mr. Guillery.) A ball 17.5 mm. in diam. is sunk onto a test brick

covered with a leaf of tinsel $^1/_{10}$ mm. thick, that has been blackened with hydrogen sulphide. Oblique jamming is prevented by ball bearings. A constant pressure of 500 kgs. for 1 min. leaves an imprint on the foil, the diam. of the impression being an indication of the brick's resistance. The method is rapid, sensitive and leaves the brick practically unaffected. LOUIS NAVIAS

34. Temperature coefficients of the electrical conductance of pure metals. L. HOLBORN. *Seit. für Physik.*, **8**, No. 1, 58–61(1921).—The observed values for heated metals between 0° and 100° are given below.

Ni	0.675	Rh	0.443	Ir	0.411
Co	0.658	Mo	0.435	Ag	0.410
Fe	0.657	Cu	0.433	Au	0.400
W	0.465	Cd	0.424	Pt	0.392
Bi	0.446	Pb	0.422	Pd	0.377
Al	0.445	Zn	0.415	Ta	0.347

WM. M. CLARK

35. Particle-size analysis of granular and powdered materials. FERET. *Rev. Mat. Constr. Trav. Pub.*, **147**, 237–39(1921).—(Read before the French and Belgian members of the International Association for Testing Materials.) F. describes and criticizes generally three methods of sepg. a material into divisions according to sizes of particles, namely for wet sepns., by sedimentation and by levigation, and for dry sepns. by currents of gas. F. has proposed a classification of particles according to sizes, which he submits to the Association and to the permanent Commission of Standardization with the hope that it will become international. The group names are the French names which F. has coined from the words given in parenthesis after them. The numbers refer to the max. and minimum dimensions for any group in mms.:—Primary Groups, "Nucles" (**nucleus**) 100–10; "Granes" (**granum**) 10–1; "Rugues" (**rugatus**) 1–0.1; "Pulvres" (**pulvis**) 0.100–0.010; "Plastes" (**plasticity**) 0.010–0.001; "Moves" (**movere**) 0.0010–0.0001. (The last group showing Brownian movement.) Each primary group is divided into three secondary groups, having the prefixes "mega," "meso" and "micro," which refer to the 10–5, 5–2, and 2–1 parts of each primary group respectively, thus:—"megaplastes" (0.010–0.005), "mesoplastes" (0.005–0.002), "microplastes" (0.002–0.001). LOUIS NAVIAS

36. Japanese acid clay (fuller's earth), its properties, chemical applications and the relation to the geological formation of petroleum. KIUHEI KOBAYASHI. *Kôjin Kwagaku Zasshi* (*Eng. Chem. J.*), **1**, 15–23(1921).—A summary of the properties of the clay, the place of production, its applications in the chem. industries, and its relation to the geol. formation of Japanese petroleum. Cf. *Jour. Am. Ceram. Soc.*, **4**, 503(1921). K. K. (*C. A.*)

37. The physical chemistry of the crystallization and magmatic differentiation of igneous rocks. III. J. H. L. VOGT. *J. Geology*, **29**, 515–39(1921); cf. *C. A.* **15**, 2813, 3808.—This section is devoted largely to the discussion of the difference between the soly. of the ferromagnesian silicates in acid and basic magmas. W. F. H. (*C. A.*)

38. Note on the green color of tungsten trioxide WO_3. J. A. M. v. LIEMPT. *Z. anorg. allgem. Chem.*, **119**, 310–12(1921).—The green color is due to a slight reduction of WO_3, probably to W_2O_5. This was shown by mixing samples of WO_3 with 1% of oxalic acid and allowing to stand a week in the light and in the dark. The reduction goes on more rapidly in the light and the presence of 1% of W_2O_5 or less will account for the green color. The conclusion is that the green color is probably due to the reduction by org. matter, *i. e.*, dust, and is furthered by light. P. E. BROWNING (*C. A.*)

39. Merwinite, a new calcium magnesium orthosilicate from Crestmore, California. ESPER S. LARSEN AND WILLIAM F. FOSHAG. Wash., D. C. *Am. Mineral.*, **6**, 143–8

(1921).—This mineral, which is named after H. E. Merwin, occurs in abundance in metamorphic limestone, having previously been mistaken for monticellite. It is intimately associated with spurrite and an unidentified mineral, called "A." It is apparently monoclinic, showing polysynthetic twinning and has $\alpha = 1.708$, $\beta = 1.711$, $\gamma = 1.718$, sign + and $2V = 66^1/_2°$. There is perfect cleavage on (010); H. = 6, sp. gr. = 3.150; colorless to pale greenish, with vitreous luster, or greasy when intimately mixed with the other minerals. Material for analysis was sepd. with heavy solns., and was found under the microscope to contain less than 2% of admixture. It dissolves in HCl and gelatinizes. Analysis gave: SiO_2 35.50, 35.84, Al_2O_3 0.66, FeO_3 none, CaO 49.96, 49.70, MgO 11.62, FeO 1.23, loss at 110° 0.12, ign. 0.94 (part of the last 2 items being bromoform used in sepn.) sum 100.02%. This corresponds closely with 3 $CaO.MgO.2SiO_2$ or $Ca_3Mg(SiO_4)_2$. It alters readily to secondary minerals often appearing as a white coating or crack filling; one of them, thaumasite, has already been described (*C. A.*, **14,** 1948). The compd. does not appear in any of the $CaO\text{-}MgO\text{-}SiO_2$ systems which have been studied thermally, and is probably a low temp. form, breaking down below its m. p. Its association with wollastonite shows it to have crystd. below 1190°, but its occurrence suggests still lower temps. It is not closely related to any known mineral, differing from the olivine group in crystn. E. T. W. (*C. A.*)

Refractories and Furnaces

40. Eastern Steel Company new blast furnace. Richard Peters, Jr. *Blast Furnace Steel Plant*, **10,** 113–6(1922). E. J. C. (*C. A.*)

41. Discussion on the disintegration of blast-furnace linings. R. M. Howe. *Blast Furnace Steel Plant*, **10,** 161–3(1922).—Analyses are given of deteriorated linings in which no Zn was found, although the action of the linings was similar to those before. There was an increase in potash, carbon and other substances. Cf. F. W. Lurmann, *Stahl u. Eisen*, **18,** 168(1917); E. Firmstone, *Trans. Am. Inst. Mech. Eng.*, **34,** 437(1903); Bernhard Osann, *Stahl u. Eisen*, **23,** 823(1903); R. M. Howe, *Bull. Am. Inst. Mech. Eng.*, **1920,** 5. W. A. Mueller (*C. A.*)

42. Disintegration of blast-furnace linings. P. O. Menke. *Blast Furnace Steel Plant*, **10,** 116–8(1922).—Experience at the Shenango Furnace Co. plant, Sharpeville, Pa. shows that in a number of cases, furnace linings have so expanded as to cause bursting of the furnace shells. These linings were ordinarily found to be vitrified and of good character for a penetration of 2–4 in., then a softening of the brick took place which often carried to within 4 or 5 in. of the outer steel shell. The deterioration was to such an extent as to make the removal of the lining possible by hands when the vitrified portion had once been removed. This "softened" portion contained up to 50% Zn in the form of both oxide and metal. The make of brick, whether hand made or steam pressed makes no difference in this penetration action of the zinc. The action of the Zn seems to be cumulative and even with small amts. this takes place.
W. A. Mueller (*C. A.*)

43. A type of natural draft melting furnace. II. Chas. Vickers. *Brass World*, **18,** 49–52(1922); cf. *C. A.*, **15,** 3061.—Detailed erecting directions are given. For brass melting furnaces, bricks of medium coarse grain with a good strong burn are best. The six standard shapes of fire-brick and stack construction are discussed.
W. H. Boynton (*C. A.*)

44. The preparation of zirconia from Brazilian ore and a new method of determination. E. C. Rossiter and P. H. Sanders. *J. Soc. Chem. Ind.*, **40,** 70–2T(1921).—Soln. of Brazilian ore is best effected by fusion of ore ground to flour fineness with an equal quantity of NaOH in an Fe crucible with continuous stirring until the mass be-

comes granular, after which the heat is maintained at dull redness for 2 hrs. The fused mass is extd. with water, then with HCl. The insol. residue equals about 20% of the ore and contains: 61.55% ZrO_2, 29.32% SiO_2, 1.10% Fe_2O_3, 1.80% Al_2O_3, 5.90% loss on ignition. The soln. contains Zr oxychloride, Fe, Al, Ti, Mn, etc. It is dild., treated with satd. SO_2 soln. and heated to boiling. Sufficient *N* H_2SO_4 is added to replace the Cl in the oxychloride; Zr is deposited as basic sulfate, easy to filter, though very bulky. It is washed by decantation. ZrO_2 recovery is made by drying and igniting, or by suspending in water, treating with alkali, washing, drying and igniting the hydroxide. The ZrO_2 contains 98–99% ZrO_2, some SiO_2 and Al_2O_3 and less than 1 part of Fe in 100,000. Properties of the basic sulfate and oxychloride are given. To det. of ZrO_2 in presence of Fe and Al 7 cc. H_2SO_3 and 2 cc. H_2SO_4 are used for each 0.2 g. of ZrO_2. The soln. should be dild. to 150 cc. for each 2 cc. of H_2SO_4. Difficulty due to formation of H_2SO_4 in the reaction is overcome by boiling, after the addition of SO_2 soln. until Fe is completely reduced. Complete separation from Fe_2O_3 is obtained in proportions up to 1 : $3^1/_2$ but, with larger proportions of Fe the basic sulfate is slightly soln. in the $(NH_4)_2SO_4$ and NH_4Cl formed during neutralization. W. H. B. (*C. A.*)

45. Fusibility of open-hearth slag containing titanium dioxide. GEO. F. COMSTOCK. *Chem. Met. Eng.*, **26**, 165–6(1922).—Basic open-hearth furnace slags varied in solidifying point from 1085° to 1385° but in both cases the addn. of TiO_2 lowered the fusion point. The amt. added was at first 0.33% to correspond to the quantity which the usual addn. of 3 lbs. of Fe-Ti per ton of steel might bring into the slag. It had no distinct effect. 1.33% and 2.67% gave solidification points of 1055° and 1025°, resp., with the more fusible slag. The less fusible slag had its softening point lowered 80° by 2.67% TiO_2. TiO_2 makes basic open-hearth slag more fusible whether oxidizing or reducing conditions prevail. JAS. O. HANDY (*C. A.*)

PATENTS

46. Furnace and method of conveying materials. HARRY P. MCCANN. U. S. 1,400,367, Dec. 13, 1921. In a fur. heated by gases of combustion, a heating chamber with a hearth having a longitudinal slot therein and a work-moving member disposed in the slot; the slot is wider than the work-moving member which forms clearance spaces between the work-moving member and the walls of the slot; a flue in the hearth connected to the slot conducts the waste gases of combustion away from it. C. M. S., JR.

47. Basic refractory brick. SPENCER B. NEWBERRY. U. S. 1,400,087, Dec. 13, 1921. The process of making basic refrac. brick by calcining a mixt. of lime and argillaceous matter in such proportions that the resulting clinker will not disintegrate after long-continued heating or an exposure to air; adding to the clinker a mixt. of lime and argillaceous matter of greater fusibility than the clinker; molding the mixt. into blocks and burning the blocks at approx. the temp. used in burning ordinary fire-brick. C. M. SAEGER, JR.

48. System of kilns. LEROY WEEKS. U. S. 1,404,412, Jan. 24, 1922. A pair of kilns, each being equipped with an annular heat chamber disposed in the walls of the kiln, above the surface of the ground; a subterranean passage from one kiln has its outlet disposed between the two kilns; a flue communicates with the outlet of the subterranean passage and with the heat chamber of one of the kilns through the side wall thereof. C. M. SAEGER, JR.

49. Apparatus for burning bricks. WILLIAM WALLACE DICKINSON, JR. U. S. 1,403,300, Jan. 10, 1922. Apparatus for burning bricks comprising, in combination, a traveling crane, a row of kilns located beneath the crane (the kilns having a scoving consisting of rectangular panels of heat resistant material), and means carried by the crane whereby the panels may be transported bodily from kiln to kiln. C. M. SAEGER, JR.

50. Apparatus for burning bricks. WILLIAM WALLACE DICKINSON, JR. U. S. 1,403,301, Jan 10, 1922. A row of brick kilns combining an automatic coal stoking device movably supported at each side of the row and adapted to be presented to the kilns sucessively in heating relation. C. M. SAEGER, JR.

51. Tunnel-kiln. GEORGE W. BOOTH. Canada 1,403,734, Jan. 17, 1922. A tunnel kiln has an air space formed in its walls extending longitudinally of the preheating, firing and cooling zones of the kiln; a fur. communicates with the interior of the firing zone of the tunnel adjacent the cooling zone; a stack adjacent the inlet end of the preheating zone; a flue communicates with the interior of the firing zone of the tunnel and extends along the preheating zone of the fur. to the stack; a flue forms a communication between the stack and the air space aforesaid adjacent the inlet end of the tunnel. C. M. SAEGER, JR.

52. Rotary kiln. JOHAN SIGISMUND FASTING. Denmark 1,404,381, Jan. 24, 1921. A rotary kiln with a clinker cooling device includes an annular chamber concentric with the kiln; it is open at one end and communicates at the other end with a chamber at the end of the kiln and into which the clinker is discharged; the clinker travels through this chamber longitudinally. Means is provided to introduce into the open end of the annular chamber cooling air in excess of that required for combustion in the kiln; the escape of an excess of air from the chamber at the end of the kiln is also provided. C. M. SAEGER, JR.

53. Kiln furnace. FRANK M. MARRIS. U. S. 1,407,288, Feb. 21, 1922. The combination of a kiln with fuel and draft openings having a single integral frame and openings corresponding with the fuel and draft openings; a vertically pivoted auxiliary door inside of the vertically pivoted door; means actuated by opening the vertically pivoted door for swinging the lower edge of the horizontally pivoted door outward. C. M. SAEGER, JR.

54. Continuous kiln. WALTER G. DE STEIGNER. U. S. 1,407,192, Feb. 21, 1922. The combination in a continuous kiln having a substantially horizontal middle portion and downwardly directed end portions; means for moving a series of mechanically unconnected and separated articles to be treated by intermittent successive steps up one end portion across the middle portion and down the other end portion; means for independently supporting the separated articles during the interval between stepped movements. C. M. SAEGER, JR.

55. Furnace roofs. H. L. CHARLES. U. S. 1,394,470, Oct. 18. An integral structure of highly refractory material such as a SiO_2, lime, fire-clay, MgO or chromite compn. is molded over the fire-brick arched roof of furnaces such as reverberatory smelting furnaces and is baked by the action of the furnace gases. (*C. A.*)

56. Refractory article of magnesia and alumina. R. C. PURDY, M. F. BEECHER AND A. A. KLEIN. U. S. 1,394,442, Oct. 18. A bonded material suitable for lining furnaces or making refractory receptacles is prepd. by mixing pre-shrunk granules of one of the ingredients, MgO or Al_2O_3, with the other of these 2 ingredients in finely divided condition and heating the mixt. to a temp. somewhat below the m. p. of any eutectic of the MgO-Al_2O_3 system to effect bonding. (*C. A.*)

57. Rendering furnace walls impervious to gases. C. M. SHIPMAN. U. S. 1,387,739, Aug. 16. Furnace walls are rendered impervious to the passage of hot combustion gases by treating the walls with a slurry formed of clay, SiO_2 and sol. silicate and then exposing the treated walls to hot combustion gases. (*C. A.*)

58. Dry gas-cleaning tower. F. R. MCGEE AND G. W. VREELAND. U. S. 1,396,767, Nov. 15. The tower comprises superposed dry cleaning and filtering chambers having filtering mats with vibrating mechanism to clean the mats. (*C. A.*)

59. Oven adapted for burning ceramic ware. S. TROOD. U. S. 1,393,650, Oct.

11. The oven has a long heating chamber through which the articles to be heated are carried and comprises zones of approx. uniform temp. with intermediate zones of changing temp. The oven may be heated by gas or other fuel. (*C. A.*)

60. Heating blocks for fireless cookers. E. T. YOUNG. U. S. 1,391,037, Sept. 20. Blocks which have the heat-retaining qualities of soapstone are formed by blending kaolin with a pulverized fired kaolin and firing the mixt. at a high temp. Equal amts. of No. 9 Edgar's ball clay and No. 15 mesh fire-brick grog may be used, fired to cone No. 7. (*C. A.*)

61. Blowpipe adapted for heating, welding or cutting. G. L. WALKER. U. S. 1,395,537, Nov. 1.

Abrasives

PATENT

62. Abrasive for grinding and smoothing glass. W. L. KANN. U. S. 1,387,649, Aug. 16. Glass is ground and smoothed preparatory to polishing by the action of particles of cryst. or similar abrasive material which is broken down into successively smaller and smaller cryst. particles during the grinding and smoothing operations. (*C. A.*)

Stoneware, Whiteware and Porcelain

63. Scumming of whiteware and the peeling off of glazes. ANON. *Sprechsaal*, **54,** 429(1921).—In whiteware there is often a tendency for the glaze to peel off especially along the edges. This is due to sol. sulphates which are more abundant along the edges than other places. This scum prevents the glaze from sticking to the body and hence the glaze has a tendency to peel. By the use of $BaCl_2$ or $BaCO_3$ the scumming and hence the peeling of the glaze may be prevented. H. G. SCHURECHT

64. The insulation of high-voltage transmission lines. Conception of a million volt line. F. W. PEEK, JR. *Gen. Elec. Rev.*, **25,** 111–9(1922).—Porcelain is the only material available at present for high potential insulators. C. G. F. (*C. A.*)

BOOK

65. Die Porzellan-Isolatoren. G. BENISCHKE. Berlin: Julius Springer. 94 pp. M 24. **Die Geschichte der Porzellanfabrik zu Tettau.** LEIPZIG: Eulen-Verlag. 64 pp. M 10. (*C. A.*)

PATENT

66. Mixture for making bricks. J. SMITH. U. S. 1,385,757, July 26. A mixt. for brick making is formed of cement, coal ashes and brick dust in about equal amts. (*C. A.*)

Heavy Clay Products

PATENTS

67. Building tile and wall made therefrom. LEONARD H. DE FERNELMONT. U. S. 1,409,284, March 14, 1922. A wall composed of a plurality of tiles directly interlocked both in a vertical direction by immediate contact and in a lateral direction by means of ribbed and grooved interengaging parts on the respective adjacent edges of the abutting tiles; the adjacent edges on each side of the interlocking portions of abutting tiles are provided with grooves, the grooves outwardly flaring and opening on the faces of the wall and between the abutting tiles; cement fills the grooves to form a sealed joint between the tiles and a smooth outer continuous surface in the plane of the tiles and holds the tiles from tilting out of their common plane of alignment. C. M. S., JR.

68. Open-end hollow tile for wall structures. MATHIAS DOCHNAL. U. S. 1,406,354, Feb. 14, 1922. A building tile for wall structures comprising an inner wall section

and an outer wall section, and a pair of spaced cross-walls which unite the inner and outer wall sections; each of the cross-walls have concaved faces which form a circular central opening in the tile and a semi-circular opening at each end of the tile; a pair of opposed ribs, which extend into the central opening from the inner and outer wall sections, the ribs each having a beveled inner face uniting with the concaved faces of the cross-walls to strengthen the inner and outer wall sections midway their length; facial ribs are arranged in opposed relation at the extremities of the inner and outer wall sections and each of the ribs have a beveled inner face terminating with the ends of the concaved faces of the cross-walls. C. M. SAEGER, JR.

69. Wall construction and brick therefor. ROBERT F. MARTIN. U. S. 1,400,893, Dec. 20, 1921. A brick for wall construction comprising a solid face portion; an inner portion of spaced-end sections constituting with the face portion the wall-supporting portions of the brick; an intermediate portion comprising a lateral web which connects the end sections intermediately with their upper and lower surfaces, and provided intermediately between its longitudinal edges and its upper and lower sides with relatively narrow non-mortar receiving ribs. C. M. SAEGER, JR.

70. Drier for use in the manufacture of articles from tender clay. THOMAS L. MYERS. U. S. 1,403,440, Jan. 10, 1922. Drying app. of the kind described for use in drying articles of tender clay. This consists (1) in a drying room, a plurality of tracks therein to receive the trucks loaded with clay articles to be dried, (2) means to radiate heat to the clay articles on the trucks without air current drying tunnels; (3) means over which the trucks are thereafter moved to the drying tunnels for complete drying in a current of heated air. C. M. SAEGER, JR.

71. Tool for handling tiles. ALBERT A. CLYMER. U. S. 1,401,046. Dec. 20, 1921. A tile rolling tool with a handle and with long arms which are practically straight and parallel to each other and some distance from each other. These arms extend laterally. They have bearing surfaces to permit the tile to roll while engaged by the tool, one of the arms being adjustable relatively to the other arm for the purpose specified; the handle is bent intermediate to its end to provide the first arm, the adjustable arm has a socket; the sockets are slidably engaged with the handle, and individual means to secure the sockets to the handle. C. M. SAEGER, JR.

72. Automatic tile-cutter. NOEL C. WHITNEY. U. S. 1,400,473, Dec. 13, 1921. In a machine for the purpose specified, there is a combination of a pair of endless carriers arranged side by side with their inner runs parallel; a series of supporting members mounted on the carriers; when on the adjacent runs of the carrier these members support the material being operated upon; a series of cutting devices mounted on the carriers and adapted to operate upon the material is supported by the members during the travel thereof. C. M. SAEGER, JR.

73. Building block. ARTHUR G. HATCH. U. S. 1,408,733, March 7, 1922. A building block which has a plane face, the opposite face carrying convex cylindric flanges adjacent to the opposite edges of the block; the axis of the cylindric of the flanges are parallel to the plane face and parallel to the adjacent edge of the block. C. M. SAEGER, JR.

74. Arch-brick. ALFRED H. WILLET. U. S. 1,401,022, Dec. 20, 1921. A pair of brick members each having support-engaging parts and brick engaging parts at opposite ends; the brick engaging parts are substantially counterpart and substantially complementary and arranged with respect to each other; the support engaging parts make the brick members variable as to effective length to fit different spacings of supports; the brick engaging portions coöperating to provide reciprocal support for the adjacent ends of the members throughout the range of adjustment. C. M. SAEGER, JR.

Glass

75. Historic optical glasses. P. NICOLARDOT. *Le Verre*, **2**, 29–32 (1922).—Dollard in 1755 made the first achromatic combination for a lens, using crown and flint glasses. This new use for flint glasses caused a demand for homogeneous heavy lead glasses, with the result that a number of men attempted to make them. Prizes offered by the (French) Academy of Sciences helped to sustain interest. Much credit is due to Pierre-Louis Guinand who made radical changes in the methods of making optical glass in his day. Among other improvements was the introduction of stirring. This was accomplished by stirring the molten glass with a clay thimble thus insuring a glass having the same index of refraction throughout. About 1805 Fraunhofer and Guinand worked together at Benedictbeuren. Later Guinand's son and Bontemps divided the prize given by the (French) Society for the Encouragement of National Industry, for having perfected a method of producing good quality flint glass on a commercial scale. Both men used the methods of the elder Guinand. Through the younger Guinand and Bontemps there have been developed two of the large modern European firms making optical glass. From Guinand through a number of partnerships has resulted the French firm of Mantois, now known as Parra. Bontemps, for political reasons, was obliged to leave France, and in 1848 he joined the Chance firm in England, introducing to them the methods of making optical glass. The German firm, Schott, founded in 1882, without doubt followed Guinand's methods. LOUIS NAVIAS

76. Lime in glass batches. ANON. *Pottery Gazette and Glass Trade Review, The Glass Worker*, **41**, No. 26, 11–12 (discussion at meeting).—Action depends on form of alkali and form of lime used and ratio of lime to soda. In tanks using 8% lime, soda-ash-burnt-lime melts fastest and saltcake-burnt-lime melts slowest. In 12% lime glass, slaked-lime with either soda-ash or saltcake or both, melts fastest. Small amounts of magnesia aids melting. R. J. MONTGOMERY

77. Use of cullet in melting glass. ANON. *Pottery Gazette and Glass Trade Review, The Glass Worker*, **41**, No. 26, 12 (discussion at meeting).—Up to 50% cullet aided in melting, plaining and uniformity. Above this amount, glass is hard to free from bubbles. 33% recommended. R. J. MONTGOMERY

78. Glass decoration (lecture before the "British Pottery and Glass Trades"). J. T. FEREDAY. *The Glass Worker*, **41**, No. 26, 18.—General method of cutting, engraving, intaglio and cameo cutting, etching and color decoration is given. R. J. MONTGOMERY

79. Action of metallic lead in pots. HENRY W. HESS. *The Glass Worker*, **41**, No. 28, 14.—Metallic lead was put in a pot holding 150 lbs. of litharge batch. The melt was clear, there was no action on the pot bottom and no trace of metallic lead in the glass. Six trials gave the same result. R. J. MONTGOMERY

80. Liquid inclusions in glass. CHARLES E. BENHAM. *Geol. Mag.*, (March) **1922**; *Nature*, **1922**, April 8, 456, **1922**.—A glass tube about 3″ long and 1/4″ external diam. was partly filled with water and sealed. It was enclosed within an unbaked brick and fired in a brick kiln at about 1200°C. After this treatment the glass was found to contain microscopic liquid inclusions with vapor bubbles comparable to those found in quartz. WM. M. CLARK

81. Dispersion in optical glasses. III. F. E. WRIGHT. *J. Optical Soc. Am.*, **5**, 389–97(1921); cf. *C. A.*, **14**, 3135; **15**, 2343.—A table is given based on the conclusions of the 2 previous articles from which by arithmetical interpolation the mean dispersion and the corresponding partial dispersions can be read off directly to the 5th decimal place. The table is tested by series of fluor crowns, borosilicate crowns, barium crowns, flints, borosilicate flints, and barium flints. The errors found are commonly restricted to the 5th decimal place. "The chief optical differences in glasses are not differences in

the character of the dispersion, but in the fact that 2 glasses may have the same dispersion relations and yet have appreciably different abs. refractive indices. In a dispersion formula both refringence and dispersion should be specifically recognized; the first as a const. giving the datum level of refringence and the second as a function of one or more terms expressing the run of dispersion throughout the visible spectrum. These conclusions follow directly from the analysis of the linear relations which have been shown to exist between the partial dispersions of a series of optical glasses. They prove that a rise in the partial dispersion at any part of the spectrum is accompanied by a corresponding rise in partial dispersions over the entire visible spectrum."

G. E. BARTON (*C. A.*)

82. Automatic vial necking and bottoming machines. J. F. SPRINGER. *Glass Ind.*, **2**, 266–9(1921); 2 illus.—In the necking machines the necks are formed on pieces of tubing of a size for 2 vials one end at a time, the pieces being fed twice through the machine. The bottoming machine takes these tubes and seals off the center, forming the bottoms of the otherwise completed vials. J. B. PATCH (*C. A.*)

83. The electrical properties of glass. J. R. CLARKE. *Glass Ind.*, **2**, 221–3(1921).—Cf. *Ceram. Abs.*, **5**, 48(1922). J. B. PATCH (*C. A.*)

84. Steam gage glasses. J. F. SPRINGER. *Glass Ind.*, **2**, 240–3(1921); cf. *Ceram. Abs.*, **5**, 81(1922).—S. suggests greater tolerance in specifications for steam gage glasses with use of a proper washer, utilization of the waste tubing for lubricator tubes and the possibility of tooling the ends of the tube to meet specifications. J. B. PATCH (*C. A.*)

85. The effect of temperature upon the ultraviolet absorption of glasses. W. RIEDER. *Jahrb. Phil. Fak. II, Univ. Bern.*, **1**, 148–54(1921).—Twelve varieties of glass were studied at temps. up to 450° and in one case down to the temp. of liquid air and with wave lengths down to 2250 Å. All exhibited a transmission limit below which the transmission for all shorter wave lengths was zero. Increase of temp. in all cases raised this transmission limit toward the region of longer wave lengths. The data are recorded in the author's thesis ms. in 48 tables. E. W. W. (*C. A.*)

86. Free alkalinity in glass containers. A. W. BITTING. *Glass Ind.*, **2**, 235–7 (1921).—The results of 72 tests of typical bottles from various sources and of different shapes and sizes are tabulated. Flint, blue, green and amber glasses are included. The containers were filled to capacity with dil. H_2SO_4 and also distd. H_2O and allowed to stand from 1 to 48 hrs. The sol. alkali is expressed in mg. NaOH per 1. The av. results range from 0.40 mg. NaOH per 1. from a 250-cc. bottle to 26.64 and 33.92 mg. per l. obtained from a 5-cc. container. The effect of standing 2 weeks is just about to double the original reading and after that the increase proved to be very slow. The results of these tests indicate that American bottles have a low free alkalinity (at variance with what has been assumed to be true for machine-made ware). The quantity is so low as to be practically neglibible for any except very delicately balanced chem. products. J. B. PATCH (*C. A.*)

87. The manufacture of glass milk bottles. A. L. BROWN. *Glass Ind.*, **2**, 259–62 (1921).—A detailed story from raw materials and their handling through the melting and gathering of the glass to the sorting and packing of the finished product. A typical batch for milk bottles is: sand 2,000, soda ash 750, lime 250, niter 21, Mn 12–35 (av. 16), powdered blue 2 ounces. J. B. PATCH (*C. A.*)

88. Graded seal for joining pyrex to lead glass. W. C. TAYLOR AND AUSTIN BAILEY. *J. Ind. Eng. Chem.*, **13**, 1158(1921).—The seal consists of five glasses of Pb-free borosilicate compn., intermediate between pyrex and Pb-glass, which are all comparatively stable and can be worked repeatedly without devitrification. The range in softening point varies from 817° to 623° and the linear expansion coeff. from 0.0000032 to 0.0000089 per degree. GEO. W. STRATTON (*C. A.*)

PATENTS

89. Method and apparatus for drawing sheet glass. FERNAND E. DEULIN. U. S. 1,411,079, March 28, 1922. In a glass-drawing app. in which a sheet of glass is drawn vertically and then bent over a bending roll, a gas pipe with a longitudinal series of perforations, placed closely above and substantially parallel with the roll, so that a continuous series of flames from the perforations will play on the horizontal run of the sheet as it leaves the roll. C. M. S., JR.

90. Glass-cutting mechanism. HARRY S. DEPUTY. U. S. 1,407,736, Feb. 28, 1922. In a sheet glass scoring device, an axial support, a cutter mounted on the support, means for adjusting the cutter longitudinally of the support, and means for adjusting the support and cutter circumferentially, both means being operative from one end of the support. C. M. S., JR.

91. Glass-cutting table. HARRY M. BARBEAU. U. S. 1,410,153, March 21, 1922. In a glass-cutting table, a stationary guide measure, a slidable guide measure, a slidable stop coöperating with each guide measure, means for securing the slidable stops in fixed position, and means the position of which is limited by the slidable stops for detg. the line along which the glass is to be cut. C. M. S., JR.

92. Frost and obscuring condensation preventative for glass surfaces and method of preparing the same. PHILLIP SHERMAN. U. S. 1,410,839, March 28, 1922. A frost and obscuring-condensation preventive for glass surfaces, comprising a piece of fibrous material treated with a mixt. of mineral oil, vinegar, water and calcium chloride. C. M. S., JR.

93. Method and apparatus for marvering glass. DAVID E. GRAY AND FRANK E. BARDROF. U. S. 1,410,803, March 28, 1922. In a glass-working app., the combination with a main frame, of a blow-pipe carrying frame mounted for movement in the main frame, a marvering roller mounted for movement on the blow-pipe frame toward the blow-pipe and for a tilting movement in respect thereto, resilient means tending to move the roller, control mechanism on the main frame normally free from the roller, but adapted to be operatively engaged therewith by the movement of the blow-pipe frame, and when put into engagement therewith, adapted to first release the roller for movement toward the blow spindle and for then releasing it for its tilting movement; and means including the blow-pipe for rotating the marvering roller. C. M. S., JR.

94. Heat-resisting iron-chromium-nickel alloy. J. T. GLEKLER. U. S. 1,389,133, Aug. 30. An alloy adapted for glass molds or furnace parts is formed of Cr 15–40, Ni 1–15 and Fe to make a total of 100 parts, with small amts. of Si, Ti, Mn and C. (*C. A.*)

95. Muffle oven for decorating or annealing glass or enamel ware. C. E. FRAZIER. U. S. 1,389,583, Sept. 6. See *Ceram. Abs.*, **5**, 75(1922). (*C. A.*)

96. Glass-covered steel rolls. K. MATSUO. U. S. 1,394,684, Oct. 25. Rolls adapted for printing patterns on cloth are formed of steel pipe, the outer surface of which is smoothed and covered with a layer of milk glass which is rich in metallic constituents such as to give it about the same coeff. of expansion as steel. (*C. A.*)

97. Glass containing mica or asbestos. P. B. CROSSLEY. U. S. 1,394,973, Oct. 25. Mica or asbestos is dissolved in molten glass at a temp. below that at which the mica effloresces, to obtain an *elec. insulating material.* (*C. A.*)

98. Glass composition. E. E. FISHER. U. S. 1,394,296, Oct. 18. A glass adapted for the manuf. of baking or lab. dishes is formed of SiO_2 60–90%, B_2O_3 3–15%, oxides of Mg, Zn or Ba 3–15%, Al_2O_3 0.5–5% and oxides of Na, K, Li or Rb 6% or less. *C. A.*

99. Daylight glass. D. N. MACDONALD. U. S. 1,393,804, Oct. 18. Finely ground

Co-blue glass is thinly spread over and fused into the glass diffusing of enclosures for incandescent lamps to absorb excess red and yellow rays. (*C. A.*)

100. Glass working—glass—metal joints. H. Weiss. *Brit. Pat. Appl.* 174,925. *Ill. Off. Jour. Pats.*, **629,** March 29(1922).—An air tight joint for an anode is formed by metal coverings sprayed or deposited by electrolysis on the anode insulator, and comprises hollow rings having slits and containing a pliant material which melts when heated and passes into the slits so as to seal the joint; the metal covering extends over the hollow rings. Sketched. Wm. M. Clark

101. Aluminum, tungsten, and other oxides, alkali aluminates, tungstates, etc. J. D. Gat. *Brit. Pat.* 174,908. *Ill. Off. Jour.*, **622,** March 29(1922).—Describes equipment for preparing compounds of metal oxides with alkalis, such as aluminate or tungstate. Chlorine and sodium are liberated in the app. by electrolysis of fused NaCl, the sodium then reducing the clay, kaolin, bauxite, orthoclase, spodumene, etc., used. Wm. M. Clark

102. Method of and appliance for polishing glass and the like substances. William Taylor. England 1,409,888. The method of controlling the supply of liquid lubricant in the polishing of a surface by means of a polishing member. This member and the work are moved relatively to one another to effect the polishing, which method comprises utilizing the variation of frictional resistance between the surfaces of the work and polishing member to effect variation of the supply of lubricant. C. M. S., Jr.

103. Machine for angular grinding spectacle glasses. Otto Henker. Germany 1,409,546, March 14, 1922. In a machine intended for angular grinding spectacle-glasses of non-circular shape, a plane cam, a stop, a grindstone, and a shaft designed for holding the spectacle-glass, the cam coöperating with the stop and being disposed on the shaft, which is free to oscillate about an axis by which it is intersected perpendicularly and the axis of the grindstone crossed perpendicularly. The stop is rotatable about an axis, which is parallel to the axis of oscillation of the shaft and at variable distance from it. It lies in the plane detd. by the axis of oscillation and by the point which the angular edge of the spectacle glass has in common with the grinding surface. The cam is displaceable longitudinally on its shaft and is compelled by the stop to permanently contain in its plane the axis of rotation of the stop, on the shaft which is rotated. C. M. Saeger, Jr.

104. Apparatus for feeding molten glass. Karl E. Peiler. U. S. 1,405,936, Feb. 7, 1922. In an app. for sepg. molten glass into mold charges, the combination of a glass container having a submerged outlet, a reciprocating air pump arranged to create pressure and vacuum on alternate strokes, a conduit connecting the pump and the surface of the glass, a pressure relieving valve and a vacuum relieving valve in the conduit, a cam for opening each valve, means for relatively adjusting the cams, and means for independently adjusting the rate at which normal pressure is restored by each valve. C. M. Saeger, Jr.

105. Method of and apparatus for finishing blown-glass articles. David E. Gray. U. S. 1,409,847, March 14, 1922. In a device of the character described, the app. with a bulb-carrying mechanism has periods of rest at a plurality of stations; a burner is located at one of these stations and adapted to preheat a narrow zone around the neck of a bulb at such station; a burner located at a succeeding station and adapted to re-heat such pre-heated zone to cause the neck to elongate, and to puncture the elongated neck and sever the same. C. M. Saeger, Jr.

106. Glassware-ejecting mechanism. Edward H. Lorenz and Karl E. Peiler. U. S. 1,406,045, Feb. 7, 1922. A glass shaping machine having a plurality of traveling molds with bottom valves, ware-ejecting means including a reciprocatory plunger,

and mechanism adapted to force the plunger against the bottom valve of each mold in succession and thereby eject the contents of the molds while traveling. C. M. S., Jr.

107. Carrier for glass articles. Henry F. Clark. U. S. 1,405,757, Feb. 7, 1922. A carrier for glass shawls, comprising a movable frame adapted to be suspended from and travel upon an overhead track, said frame having supporting means for a plurality of the shawls, and spacers or separators movably mounted on the frame and adapted to sep. and space adjacent shawls, substantially as described. C. M. Saeger, Jr.

108. Ware steadier for glassworking machines. James W. Lynch. U. S. 1,406,400, Feb. 14, 1922. A device for preventing glass articles from being forced to either side of a mold having separable sections as the mold opens, the device including a movable stop having adjustable fingers adapted to embrace an article centrally positioned in the mold, and means for periodically moving the stop into a working position in which the fingers are about, but spaced from the upper portion of the article before the mold opens. C. M. Saeger, Jr.

109. Glass-plate manufacture. Albert A. Icenhour. U. S. 1,407,036, Feb. 21, 1922. In a process of making sheet-glass, drawing the sheet from a molten mass of glass in a container approx. the width of the sheet so that the edges of the sheet at the points of formation of the sheet travel down the interior of the wall of the container during the drawing operation, the container being tapered at opposite sides to cause the adhering edges of the plate to travel in vertical lines down the vertical channels formed by the tapering of the walls of the container. C. M. Saeger, Jr.

110. Grinding or polishing of glass and apparatus therefor. Frank Edwin Slocombe. England 1,404,553, Jan. 24, 1922. An app. for grinding or polishing plate glass, the combination with two opposed discs with grinding or polishing faces in parallel or nearly parallel planes and two horizontal shafts on which the discs are respectively mounted, the shaft being nearly parallel and out of line sufficiently to secure effective grinding or polishing at the centers of the discs, of means positively to rotate one disc, and sucker devices to secure the glass to be ground to a disc surface. C. M. S., Jr.

111. Glass cutter. Walter W. Ratcliff. U. S. 1,402,961, Jan. 10, 1922. A rotary glass cutter, comprising a base, a standard thereon having a laterally projecting portion terminating in a vertical head, a stem mounted for rotation and for vertical adjustment in the head, a cutting member carried by the lower end of the stem, a spring exerting a downward pressure on the stem, and means for raising the stem and cutting member against the influence of the spring. C. M. Saeger, Jr.

112. Mechanism for forming glassware. William J. Miller. U. S. 1,400,621, Dec. 20, 1921. In a machine for manufacturing articles of glass, the combination of forming means, a carrier intermittently revolving in a vertical plane beneath the forming means, and a plurality of molds pivotally mounted on the carrier and adapted to be presented in turn to the forming means, the pivotal axes of the molds being above their centers of gravity whereby the molds normally retain their upright position. C. M. Saeger, Jr.

113. Sheet-glass-drawing mechanism. Robert P. Callard. U. S. 1,402,145, Jan. 3, 1922. A combination with a split demountable rim adapted to assume a collapsed state in its inoperative position, a double elbowed toggle having its outer ends connected to the end portions of the rim, one of the toggle links having a limited movement with respect to the toggle and disposed to overlap the rim. C. M. Saeger, Jr.

114. Glass-cutting machine. John A. Milliken. U. S. 1,402,457, Jan. 3, 1922. In a glass cutting mechanism of the character described comprising a chuck, a grinder, means for alternately moving the grinder into and out of engagement with an article to be operated upon, and a feeler member reciprocated to and from the article by corresponding movements of the grinder. C. M. Saeger, Jr.

115. Machine for the manufacture of glass articles. Robert Frederick Hall. England 1,408,939, March 7, 1922. A machine for blowing hollow glass articles including, (1) supporting frame, (2) a parison mold carried thereby, (3) means for actuating the parison mold which includes a member movable in a plurality of directions relatively to the supporting frame, (4) a knife adapted to be swung in an arc beneath the parison mold, (5) a vertically extending member on which the knife is carried, (6) means including a sleeve feathered on the vertically extending member and having a crank connected with horizontally reciprocable means for rotating the vertically extending member to effect the swinging movement of the knife beneath the parison mold, (7) bearings having a universal movement on the frame and on the relatively movable parison mold actuating member in which the vertically extending member is journaled, the vertically extending member also being slidable vertically in the bearing on the frame, whereby the knife is maintained in proper position irrespective of the relative movement of the parison mold actuating member. C. M. Saeger, Jr.

Enamels

116. Enameling cast-iron and steel materials. F. L. Prentiss. *Iron Age*, **109**, 13–16(1922).—This paper describes the methods and app. used in enameling cast-iron and steel tanks, etc., at the plant of the Elyria Enameled Products Co. The article is well illustrated. Donald E. Sharp (*C. A.*)

117. Enameled-products research laboratory. Emerson Poste. *Chem. Met. Eng.*, **25**, 974–7(1921).—The lab. and equipment are described and methods of control and research are briefly given. E. H. (*C. A.*)

Cement, Lime and Plaster

118. A compression test machine for cements. Guillery. *Rev. Mat. Constr. Trav. Pub.*, **147**, 240(1921).—(Read before the French and Belgian members of the International Association for Testing Materials.) This is an inexpensive machine for compression strengths of cement cubes of 5 cm. side and of concrete cylinders 10 cm. high and 10 cm. in diam. To a base plate is bolted a cylindrical support carrying a screw head at the top and worked by hand. A large piston with $^3/_4$ mm. play, slides inside the cylinder, a layer of rubber between them affording a tight fit. The compression chamber is placed in the base where the piston and its cylinder are suitably fitted into each other. The upper end of the piston is fitted with a removable copper support for the test piece. This support has a permanent large holder for catching the disintegrated fragments. The upper support for the cube has a slightly spherical face and is inserted into the screw head above. A compression pump, operated by hand and attached at one side, forces glycerine into the compression chamber and under the piston. A manometer indicates the pressure of the liquid. An adjustable safety valve limits the pressure, and a discharge valve relieves the pressure at the end of a test. The manometer carries three scales, the first giving the total pressure, the second giving resistance per sq. cm. on a cube of 5 cm. side, the third giving the resistance per sq. cm. for a concrete cylinder 10 cm. high and 10 cm. diam. With the piston in its lowest position, the screw is brought down on to the test piece, then the discharge valve is closed and the pump put into operation until the piece breaks. The resistance may then be read directly from the scale. A round plate 10 cm. in diam. constitutes the upper support fitted into the screw for crushing concrete cylinders. Louis Navias

119. Chemico-technical and mechanical testing of caustic magnesite. R. Poche. *Baumaterialien-Markt*, No. 36 and 38, **1921**. Reprint.—Since the value of burned magnesite as a building material can not be detd. from its chem. anal., the following tests

are necessary: I. *Sieve test.*—The residue remaining on 80 and 130 mesh sieves is detd., together with the wt. of a l. of the sieved material. No values are given. II. *Setting time.*—100 gm. magnesite are mixed for one min. with 40–52 cc. 20° Bé $MgCl_2$ soln. and poured out on a glass plate. The hardness is detd. with the Vicat needle app. The cake should be covered to prevent rapid drying. The setting time should be 2–5 hrs. III. *Expansion test.*—3 pts. by wt. of magnesite are mixed with 1 pt. of pine sawdust and moistened with 20° Bé $MgCl_2$ soln. The sawdust particles should be 50%–0–1 mm. and 50%–1–2 mm. in diam. A stick of the mixt. $^1/_2$–1 m. long is pressed out and allowed to set, being protected from drying. At least a month is required to attain const. length, although the first 10–14 days will give a good indication of the amt. of change. By the end of two weeks the linear expansion should not be $> 0.15\%$ or the contraction $> 0.25\%$. The air around the test piece must have a rel. humidity of $60 \pm 6\%$. IV. *Tensile strength.*—The test piece is made of the same material used in the expansion test. After 3 days the tensile strength should not be < 8 or > 25 kg./cm.^{2} after 7 days, not < 20, after 56 days not < 40 kg./cm.^{2}

E. N. Bunting

120. Blast-furnace cement. H. Burchartz. *Mitt. Materialprüfungsamt,* **38,** 163–182(1920).—The investigation was made to det. whether blast-furnace cement might be safely used in construction work in which the German government was interested. Six blast-furnace cements were analyzed and tested. The best and the poorest of these were compared with 2 portland and 2 iron portland cements. The tests included mortars and reinforced concrete; they lasted from 1914 to 1919. The blast-furnace slag mortars and concrete were as strong as those from portland cement. The blast-furnace cements contained 60–75% of slag. This was detd. by dividing the total sulfide S by that found in the part of the cement remaining on a 100-mesh sieve and of lower sp. gr. than 2.98. The sulfide percentages in the slags varied from 1.49 to 3.02 and were 2.42 in the weakest and 2.71 in the slag in the strongest cement. MgO in the weakest cement was 1.98% and in the strongest 2.81%. SiO_2, 27.7% and 26%, resp., Al_2O_3 and Fe_2O_3, 9.98% and 12.60%. CaO, 53.22% and 51.88%. SO_3, 1.14% in both. Undetd., 1.80 and 1.33%. The crushing strength of mixts. by wt. of 1 part cement and 3 of sand (normal) averaged for blast-furnace cement mix, 5401 lb. per in.^{2}; iron portland cement mix, 5473 lb.; portland cement mix, 4995 lb. per in.^{2} After 2.5 yrs., 1:4 mixts. by wt. showed, resp., in reinforced concrete, 7008, 7037 and 7867 lb. per in.^{2} The larger part of the admixture was a graduated one of sand and gravel. Mixts. of 1 part by wt. of cement and 5 parts of raw sand showed a crushing strength of 6000 lb. after air and water exposure for 5 yrs. and 4700 lb. per in.^{2} if in water all the time. There was no recession in strength in any of the blast-furnace cement mixt. The German government authorized the use of blast-furnace cement on government work. Cf. *Ceram. Abs.,* **5,** 50(1922).

J. O. H. (*C. A.*)

121. Plastic calcined magnesite and oxychloride cements. M. Y. Seaton. *Chem. Met. Eng.,* **25,** 233–6(1921).—The history, chem. compn. and the usual source of the raw materials of oxychloride cements are given. The following physical tests are discussed: strength, vol. change, setting, time, resistance to water and the influence of the character of the aggregate. Suggested specifications include: fineness—97% through a 100-mesh sieve, 75% through a 200-mesh sieve; setting time (plastic oxychloride mortar)—initial set not less than 1 hr., final set not more than 8 hrs.; modulus of rupture (on bars $^1/_2$ in. thick 2 in. wide and 24 in. long)—not less than 550 lb. per sq. in. at 1 day and 100 lb. per sq. in. at 7 days; expansion or contraction not less than 0.3% within 24 hrs.; wet strength should be at least 30% of dry strength. See *Ceram. Abs.,* **5,** 88(1922).

J. C. Witt (*C. A.*)

122. The successful recovery of potash as a by-product from cement kilns. C.

KRARUP. *Chem. Met. Eng.*, **25,** 316–20(1921).—The recovery of potash at the plant of the Santa Cruz Portland Cement Co. is described. Several new features have been introduced. J. C. WITT (*C. A.*)

123. Judging the quality of portland cement. R. J. COLONY. *Trans. Am. Inst. Mining Eng.*, **1921,** No. 1088, 3 pp.; See *Ceram. Abs.*, **5,** 51(1921).—A reply to discussion. C. N. WILEY (*C. A.*)

124. Action of lime in magnesium oxychloride cements. M. Y. SEATON, C. R. HILL AND L. C. STEWART. *Chem. Met. Eng.*, **25,** 270–4(1921).—The influence of active lime (CaO or $Ca(OH)_2$) on Mg oxychloride cements is discussed. Methods of detg. the amt. of active lime present on agitation with H_2O and detn. of alkalinity with phenolphthalein indicator; agitation with 5% NaCl soln. and detn. of alkalinity with methyl orange indicator; agitation with $MgCl_2$ soln. and detn. of $CaCl_2$ in the soln. Comparable results were not obtained by the use of the 3 methods. A relation between active lime content of calcined magnesites and physical properties of the oxychloride cement produced from them is brought out. This relationship is apparent only when av. results from many samples are considered. Other factors may completely obscure the relation in a test on a single sample. Active lime content is accordingly not a definite indication of poor quality in a magnesite, although a magnesite contg. active lime in large amt. should be regarded with suspicion. Physical tests of oxychloride cements must still be regarded as the only safe criterion of the quality of magnesites used in the oxychloride industries. J. C. WITT (*C. A.*)

125. An outline of the uses of lime. M. E. HOLMES. *Chem. Met. Eng.*, **26,** 294–300(1922). E. J. C.

PATENTS

126. Magnesium oxychloride cement. J. L. TUFTS. U. S. 1,386,914, Aug. 9. A dry cement material is produced by agitating calcined magnesite in a closed vessel while introducing into the material sufficient HCl gas and H_2O vapor to produce a product in the proportions of 5 MgO, 1 $MgCl_2$, 5 H_2O. (*C. A.*)

127. Plaster composition. C. NOLL. U. S. 1,393,814, Oct. 18. Plaster for use on walls or ceilings is formed of $Ca(OH)_2$ 20, clay 15, sand 40 and a porous material such as blast-furnace slag 25 parts. (*C. A.*)

128. Increasing plasticity of calcined gypsum. W. E. EMLEY. U. S. 1,392,574, Oct. 4. Calcined gypsum is ground in a ball mill to eliminate the H_2O content during the grinding operation but the H_2O is prevented from escaping and is permitted to be reabsorbed before the completion of the grinding in order to obtain a finely ground product of good plasticity. (*C. A.*)

129. Liquid ceramic pastes. E. WEBER. U. S. 1,394,241, Oct. 18. Ceramic pastes which are difficultly liquefied with alkali are treated with saponin to facilitate liquefaction in order to improve the pouring and molding properties of the material. Quillaja or senegin also may be used for the same effect. (*C. A.*)

130. Cement. WALTER T. GODDARD. Canada 1,409,091, March 7, 1922. A cement compn. containing an inert non-friable element initially coated with an elastic substance. C. M. SAEGER, JR.

131. Multiple brick mold. FRANK J. KINZINGER. Canada 1,406,460, Feb. 14, 1922. A multiple mold for concrete bricks and the like comprising end plates, a series of interposed longitudinal mold forming members each including a verticle base plate, and a series of right angle plates secured in contiguous alignment on the base plate, and means for securing the end plates and the mold forming members together. C. M. S., JR.

132. Method and machine for forming impressions in plastic articles. JOHN LAPP. U. S. 1,407,550. Feb. 21, 1922. A method of forming impressions in plastic articles which consists in gyrating a forming tool about the axis of the surface to be im-

pressed but without rotation about its own axis and gradually varying the radius of the tool's gyration. C. M. SAEGER, JR.

133. Concrete-tie-making machine. JOHN NELSON. U. S. 1,400,969, Dec. 20, 1921. A tie-making machine comprising cement feeding app.; movable mold jaws adapted to receive the cement from the feeding app.; automatic operating means for the jaws adapted for engaging the cement during operation, and means adapted for positioning a reinforcing member between the jaws for embedding in the finished tie. C. M. SAEGER, JR.

134. Method of producing a cold glaze for building materials, in particular cement. KARL FRIEDRICH. Germany 1,402,412. Jan. 3, 1922. A method of producing a cold glaze consisting in mixing a finely sifted, sandfree building material with an emulsion of water containing bituminous substances free of volatile oils and oxidized in the presence of alkalis. C. M. SAEGER, JR.

135. Means for use in the manufacture of concrete roofing tile. WILLIAM THOMAS COWPERTHWAITE. New Zealand 1,403,940, Jan. 17, 1922. The combination of a pallet adapted to support in a horizontal position a plate of plastic material and having a flange forming portion having an aperture therein; a pin adapted to project through the aperture during the molding operation and to be withdrawn after the molding operation has been completed; a bearing frame beneath the pallet; a slide mounted thereon; a rod mounted on the side slide to which the pin is fixed; a spring controlling the rod and keeping it in position to withdraw the pin from the aperture; a main shaft; a lever arm pivoted beneath the pallet and having its end engaging the back end of the rod; and means whereby the lever arm may be turned to push the rod outwardly, the means being controlled by the operation of the main shaft. C. M. SAEGER, JR.

136. Heat insulating and resisting material. EDGAR T. HOLMBERG. U. S. 1,404,438, Jan. 24, 1922. A heat insulating and resisting material made by moistening a mixture of about 30% magnesia and 70% of an infusorial siliceous earth with a saturated solution of magnesium chloride and compressing such moistened mixture in a mold. C. M. SAEGER, JR.

137. Building-block. CHARLES C. WORTHINGTON. U. S. 1,400,709, Dec. 20, 1921. As a new article of manufacture, a building block comprising a rectangular body of stonelike material cast with horizontal rectangular cavities formed by a plurality of vertical cross walls, which are disposed perpendicular to the face of the block and also by vertical longitudinal back walls forming the backs of the cavities, one of the vertical walls being a partition wall between adjacent cavities, each of the walls being of uniform thickness and a fictile nailing material cast in position in each of the cavities to be exposed on the surface of the wall constructed of such blocks. C. M. SAEGER, JR.

138. Cement-block machine. CLEMENT ZOPHY. U. S. 1,408,558, March 7, 1922. A machine of the class described comprising a supporting structure including vertical standards having their intermediate portions vertically recessed, a mold box mounted on the supporting structure, a removable pallet closing the bottom of the mold box, a slide block slidably mounted in the recess of each standard, a transverse channel beam carried by each slide block, a supporting member carried by each connected together slide block and channel beam, shafts journaled adjacent the ends of the channel beams, lifting arms carried by the shafts, roller means carried by the outer ends of the lifting arms and tracking in the channels of the beams, and means for simultaneously rotating the shafts in opposite directions to raise the pallet above the mold to permit the stripping of a block which has been formed in the mold box. C. M. SAEGER, JR.

CERAMIC ABSTRACTS

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General and Miscellaneous

1. Dry purification of kaolins. Anti Dahle. *Sprechsaal*, **54**, 393–396(1922).—The sepn. of graphite by air currents has been highly perfected. This sepn. is possible because of the sp. gr. of the different ingredients. Thus graphite has a sp. gr. of 1.9–2.3, quartz 2.5–2.8, granite 2.3–3.00, mica 2.6–3.2 and clay 1.8–2.6. Similarly the sp. gr. of kaolin is 2.2–2.6, quartz 2.5–2.8, feldspar 2.5–2.6 and mica 2.6–3.2. Two methods are used and are known as (1) air or wind separators and (2) centrifugal separators. In the first type powdered kaolin is drawn thru a chamber by means of an air current and the heavy and coarser material is deposited. By this method the crude kaolin may be separated into the following portions (1) kaolin powder, (2) coarse kaolin, (3) quartz particles, (4) feldspar particles, (5) mica particles, (6) some quartz particles, (7) some feldspar particles, and (8) crude kaolin. By means of the centrifugal process the kaolin may be separated into the following portions and in combination with the air sepn. may be still further refined. Product (1) after screening from mica and org. matter a pure kaolin is obtained. Product (3) consists of feldpar and quartz and is discarded. Product (4) is crushed a second time in rolls and again run through the separator. Product (2) is passed through the rolls and then is passed to the wind separator which separates this portion into four portions, one of which is pure kaolin. The opern. has to be adjusted for each clay. H. G. Schurecht

2. Monorail conveyors on clay plants. Anon. *Brick and Clay Record*, **60**, 613–615 (1922).—Overhead monorail conveyors system is described for handling both the raw material and ware in the various stages of its manuf. H. G. Schurecht

3. Modern installation for crushing and screening basalt. E. C. Blanc. *Rev. Mat. Constr. Trav. Pub.*, **149**, 31–34(1922).—Basalt from a certain quarry in the middle of France is crushed and screened and used for railroad and road making. A plan and photographs of the plant are given with descriptions of mech. crushers and sorters. Louis Navias

4. Some practical considerations with handling plant. Alwyne Meade. *Chem. Age* (London), **6**, 228–9(1922).—Need for considering depreciations in selection of mech. handling devices for chem. plants is pointed out. Construction of storage hoppers for hard and abrasive materials is discussed. A. E. Marshall (*C. A.*)

5. The evolution of chemical terminology. I. Coagulation. James F. Couch. *Am. J. Pharm.*, **94**, 92–7(1922).—A review and discussion. W. G. Gaessler (*C. A.*)

6. Electrical precipitation of cement mill dust. G. A. Witte. *Gen. Elec. Rev.*, **25**, 125–7(1922).—Several Cottrell elec. pptn. installations are briefly described, and the flexibility in construction is noted for both the plate and pipe types. Power may be

taken from the factory line when a synchronous motor is substituted for the motor-generator set. Multiple pipe type precipitators are energized from a 75,000-v. circuit and the plate type treaters from a 50,000-v. circuit. About 5% of the total raw material fed into the kiln is recovered as collected dust. Its utility depends upon its water-sol. K value and dets. its use for CaO-K_2O fertilizer, mixed fertilizers, or leaching for production of high-grade potash salts. Dust of low potash content can be returned at regular intervals to the kiln. Domestic and foreign Cottrell installations are listed.
W. H. B. (*C. A.*)

7. Constitution and heat of combustion. F. O. H. Binder. *Chem.-Ztg.*, **45,** 1114–6(1921); cf. *C. A.*, **16,** 10.—The heat of combustion of an org. compd. in cal. per mole may be computed from the formula: $55{,}560\,x + 23{,}570\,y + 34{,}170\,z$, where x = the no. of C-to-H bonds, y = twice the no. of single C-to-C unions, and z = twice the no. of extra C-to-C bonds. A C-to-N bond equals 35,016 cal. The article gives the results of calcns., compared to observations, for a no. of compds. The agreement is only moderately close. The ketone formula for *quinone* is less likely than the peroxide formula.
Ernest W. Thiele (*C. A.*)

8. From laboratory experiment to factory apparatus. H. Blücher. *Chem.-Ztg.*, **45,** 1133–5, 1163–5, 1182–6(1921).—This detailed discussion, contg. nothing essentially new, is written primarily for the inexperienced industrial chemist, and deals with the application of research methods to factory scale. The subjects discussed are: (*a*) quantity and nature of raw materials; (*b*) the time factor; (*c*) heating; (*d*) cooling; (*e*) high pressure technic; (*f*) vacuum; (*g*) grinding; (*h*) mixing and stirring; (*i*) settling and leaching; (*j*) filtration; (*k*) centrifuging; (*l*) distn.; (*m*) drying; (*n*) miscellaneous; (*o*) results: patents, secret processes, and marketing of product.
Theo. F. Buehrer (*C. A.*)

9. The international chemical index and the reproduction of documents. J. H. Frydlender. *Rev. prod. chim.*, **25,** 73–8(1922).—A general discussion of the problem of searching the literature on a given subject and of obtaining original articles or documents which may need to be consulted.
A. P.-C. (*C. A.*)

10. Simplified stack calculations. Otto Hoffmann. *Feuerungstechnik*, **10,** 53–6, 65–8, 79–82(1922).—Review of previous formulas and development of new formulas for computing stack dimensions from the conditions of the installation.
E. W. T. (*C. A.*)

11. The thermal expansion of chromium and of nickel-chromium alloys over an extended range of temperatures. P. Chevenard. *Compt. rend.*, **174,** 109–12(1922).—The expansion behavior of Cr over a considerable range of temp. being hitherto unrecorded, C. undertook this detn., and in addition, to study the effect of varying amts. of Cr upon the thermal expansion of Ni-Cr alloys. The expts. were performed with the differential app. previously described, in which the specimen bar is opposed by a standard bar of "Baros" (alloy of Ni-Cr contg. 10% Cr) whose rate of expansion has been directly detd. with frequent checks over the range from 0° to 1000°. Between 0° and 100° the expansion of Cr is exactly reversible, and the metal appears to be dispossessed of all thermal singularity. The true coeff., which at 0° = 6.8×10^{-6}, increases rapidly with rise in temp., the curve which traces this variation presenting a gentle concavity with increase in temp. The magnetic transformation of Ni is accompanied by rapid diminution of the true expansion coeff. and the temp. at which this change was found to occur coincides appreciably with the temp. of the Curie point detd. by thermomagnetic methods. The addition of Cr, itself having a much smaller expansion coeff. than Ni, affects little the coeff. of expansion of the latter metal at ordinary temps., but tends to increase at higher temps. This considerable disparity from the behavior of mixts. is

probably due to the presence of the compd. Ni_2Cr_3, whose existence has been established by Voss and confirmed by the author. J. T. R. ANDREWS (*C. A.*)

12. Calite—A new heat-resisting alloy. G. R. BROPHY. *Trans. Am. Soc. Steel Treating*, **2**, 384–6(1922).—Calite is an easily castable, but difficultly forgeable, alloy of Al, Ni, and Fe, which will not oxidize at temps. up to 1300°. Its m.p. is 1500°, the elec. resistivity is 112 ohms/cm.^{3}, the temp. coeff. is 0.00044, and the heat resistivity is 3.25 times that of Ni. The alloy is highly resistant to atm. corrosion, the action of acids (except HCl and H_2SO_4) molten NaCN, $BaCl_2$, S, or NaCl. It retained a perfect polish after 100 hrs. in a salt spray at 100°F. Fluxes such as cryolites, borates, and silicates attack it rapidly. The details of casting are given. W. A. MUDGE (*C. A.*)

13. First large plant using pulverized coal exclusively. ANON. *Elec. World*, **79**, 721–4(1922); illus.—A detailed account with plan of the plant shown, of 40,000 kva. central station at Milwaukee. C. G. F. (*C. A.*)

14. Characterization of clay. N. M. COMBER *J. Soc. Chem. Ind.*, **41**, 77–80T (1922).—C. concludes "The constitutional characteristic of clay which distinguishes it from other systems of siliceous mineral particles is that in clay the properties of the emulsoid and surface outweigh those of the suspensoid 'core' whereas in silt, etc., the properties of the core of the particles are not dominated by the relatively smaller amt. of emulsoid surface." WM. M. CLARK (*C. A.*)

15. Electroösmosis. P. H. PRAUSNITZ. *Z. Elektrochem.*, **28**, 27–36(1922).—A survey of expts. indicating how electroösmosis and related processes may be applied technically. The importance of further development of the electrochemistry of colloids is discussed. H. JERMAIN CREIGHTON (*C. A.*)

16. Progress in metric standardization. E. C. BINGHAM. *J. Ind. Eng. Chem.*, **14**, 332–4(1922). E. J. C. (*C. A.*)

17. The importance of low handling costs. HERBERT BLYTH. *Chem. Age* (London), **6**, 226–8(1922).—A description of the present lack of mech. handling devices in English chem. works. Pneumatic methods are given for (1) unloading from slips; (2) unloading from railroad cars; (3) conveying to storage or point of use in plant. A. E. M. (*C. A.*)

18. Preparing and distributing powdered coal. E. C. GREISEN. *Iron Age*, **109**, 326–9(1922). E. J. C. (*C. A.*)

19. Note on the production and testing of zirconia. W. R. SCHOELLER. *J. Soc. Chem. Ind.*, **40**, 127–8T(1921).—Processes for extg. zirconia from Brazilian ore by pptn. as basic sulfate (*C. A.*, **16**, 992) aim to eliminate Fe without regard to removal of Ti. Analyses of Brazilian ore by the method of Powell and Schoeller (*C. A.*, **14**, 708) show TiO_2 in quantities varying from 0.6 to 1.2%. The process based on the prepn. of crystd. $ZrOCl_2$ yields c.p. ZrO_2, but is expensive on account of the low recovery. S. modifies this process by reworking the mother liquors and wash waters obtained from the crystn. of c.p. $ZrOCl_2$ so as to obtain the remainder of the ZrO_2 in a form pure enough for industrial purposes. Analyses of samples of British zirconia show as impurities SiO_2, TiO_2, Al_2O_3, Fe_2O_3, As_2O_5, SO_3. The presence of As is highly objectionable; for its detn. 2 g. of ZrO_2 are fused with 15–20 g. Na_2CO_3 in a Pt crucible; the melt is leached with hot H_2O, the soln. filtered, acidified with HCl, and satd. with H_2S. The As_2S_3 is filtered off, evapd. with H_2SO_4 until fumes are evolved, the liquid is made alk. with $NaHCO_3$, and titrated with I soln. T. S. CARSWELL (*C. A.*)

20. The measurement of absolute viscosity. F. M. LIDSTONE. *Phil. Mag.*, **43**, 354–7(1922).—In the measurement of viscosity by the rate of flow method under varying head it is not accurate to use the mean head. If the difference between initial and final head is great the error is large. Formulas and tables are given for the accurate calcn. S. C. L. (*C. A.*)

PATENTS

21. Drying rack for pottery manufacture. CHARLES L. SEBRING. U. S. 1,410,275, March 21, 1922. In a drying rack and conveyor of the character described, a drying chamber, a compartment formed near one end of the drying chamber and provided with openings on opposite sides in the drying chamber, the adjacent end of the drying chamber being provided with an opening and a conveyor movable through a circuitous course within the drying chamber and around the compartment, the conveyor moving adjacent to all of the openings. C. M. S., JR.

22. Furnace for brick and tile kilns. HALVER R. STRAIGHT. U. S. 1,411,534, April 4, 1922. A fur. for brick and tile kilns comprising a downwardly and outwardly inclined tube through the wall of the kiln, and having means at the lower and outer end for feeding combustible gases, and at its upper and inner end means for mixing the gases as they enter the kiln. C. M. S., JR.

23. Kiln. JEROME B. RIFFLE AND LOUIS H. HARTMAN. U. S. 1,411,871, April 4, 1922. In a kiln as characterized, a flue disposed centrally of the kiln, fur. disposed at opposite sides of the kiln and having heat conducting passages connecting the centrally disposed flue, a heat reflector disposed within the lower portion of the centrally disposed flue and interposed between the opposed ends of the heat conducting passages, exit flues extending radially of the kiln beneath the floor thereof and in communication with the interior of the kiln through openings formed in the floor of the latter, the exit flues having laterally extending branches disposed inwardly of and parallel to the vertical wall of the kiln and in communication with the interior of the latter through openings formed in the floor thereof, stacks spaced around the top face of the vertical wall of the kiln and having the flues thereof extending downwardly within the latter, the lower ends of the flues in the vertical wall of the kiln being arranged in communication with the outer ends of the radially extending exit flues, and dampers operable in the flues of the stacks for controlling the distribution of the heated air in its passage through the kiln from the centrally disposed flue. C. M. S., JR.

24. Foundry sand. A. POULSON AND C. J. ROURKE. Brit. 173,687, Dec. 11, 1920. $Al_2(SO_4)_3$, 37½–45%, 37½–45% of china clay and 10–25% of ground pitch are reduced to powder and thoroughly mixed and incorporated with the sand, water being added to give the necessary dampness. To renovate an ordinary sand which has been burnt completely, about 1 cwt. per ton of sand is added. (*C. A.*)

Apparatus and Instruments

25. Difficulties encountered in the installation of a pyrometer system. R. S. WHIPPLE. *Ceramique*, **25**, 65–70(1922).—A translation of the article which appeared in *Trans. Ceram. Soc.* (1921). H. G. SCHURECHT

26. Routine gas analysis apparatus. R. V. WHEELER. *Gas. J.*, **157**, 702–3(1922); 4 figs.—A simplified adaptation of the Hempel app., which in some respects resembles the Orsat app., is described. The usual 2 sources of error (one which occurs through admittance of a bubble of air when one absorption vessel is detached from the other and substitution made, and the other due to the absence of facilities for washing the gases after treatment with the various absorbents) are eliminated and the app. is made handier in use, by connecting all the absorption vessels and the explosion vessel to the measuring buret by a system of 3-way taps, and by provision of washing facilities. The app. is adapted for the analysis of coal gas and coke-oven gas and gives results sufficiently accurate for routine work. The methods of absorption and explosion are explained and the manipulation is described. Each analysis of coal gas requires about ½ hr. Four sep. analyses can be carried on at once in different stages. J. L. WILEY (*C. A.*)

27. A new X-ray diffraction apparatus. WHEELER P. DAVEY. *J. Optical Soc. Am.*, **5,** 479–93(1921).—An app. is described by which the characteristic X-ray diffraction patterns of 15 powdered crystals may be taken at once. Each pattern is recorded on a strip of photographic film $1^7/_8 \times 16$ in. held in a cassette on the arc of a circle of 8 in. radius, at the center of which is placed the glass tube contg. the specimen. The cassettes are radially disposed on a circular horizontal table at a fixed distance from a vertical H_2O-cooled MO-target Coolidge tube. The tube is excited by a specially designed transformer without rectifiers, placed under the table, thus constituting a complete compact self-contained app. The slit system is of special design for photographic analysis and contains one ZrO_2 filter, while the other filter is built into the cassettes. The time required to obtain satisfactory results varies from 5 to 12 hrs. for substances like NaCl to from 48 to 70 hrs. for CuCl, CsI, etc. The diffraction pattern may be interpreted directly in terms of interplaner distances in the crystal by means of a metal scale calibrated in Å. Graphs are included by means of which the crystal structure may be interpreted directly from the interplaner distances for the cubic, tetragonal and hexagonal systems.
G. L. CLARK (*C. A.*)

28. High-speed high-vacua mercury vapor pumps. C. T. KNIPP. *Science,* **55,** 183–4(1922).—Two high-speed pumps are described. Sketches are given showing the simplicity of construction. The glass used is Pyrex. D. E. SHARP (*C. A.*)

29. Titration apparatus with automatically fixed zero point. ADOLF BRÄUER. *Chem.-Ztg.*, **46,** 117(1922).—The buret has cocks below and above the graduated section, the zero point being at the upper (3-way) cock, above which is a small overflow reservoir. Below the lower cock the buret is drawn to a stem which reaches nearly to the bottom of the stock bottle; the app. is filled by blowing into the bottle, the soln. being withdrawn through a side-tube above the lower cock. J. H. MOORE (*C. A.*)

30. The use of the optical pyrometer in practice. KARL DAEVES. *Stahl u. Eisen,* **42,** 121(1922).—Optical pyrometers suitable for works use are either of the Wanner or Holborn-Kurlbaum type. The latter, in which the intensity of one wave length emitted by the body to be measured is compared with a lamp filament, is the best. In the Wanner pyrometer the light is polarized and its intensity measured by the rotation of the analyzing nicol necessary to make it comparable to a standard illumination. For measurements in a muffle (black body condition) the temp. may be detd. within $\pm 10°$ with a pyrometer of the H.-K. type. If measurements are made under other conditions they must be corrected according to the formula $\log e = (C \log E/\lambda)\,(1/T_a - 1/Sa)$, where e is the emissivity of the body to be measured, $C = 14{,}500$, $\log E = 0.4343$, S_a = observed temperature, T_a = actual temp., λ the wave length of the light used in μ. Burgess' values for emissivity are: liquid iron 0.4, liquid iron oxide 0.5, refractories 0.6, liquid slag 0.65. R. S. DEAN (*C. A.*)

31. Draft device for laboratories. M. FISCHLER. *Z. angew. Chem.*, **35,** 43(1922); 1 cut.—A bent pipe or tile is inserted in the stove hole of a chimney. A gas flame in the upper end increases the draft and the lower end is placed over the mouth of the flask to catch the fumes. J. H. MOORE (*C. A.*)

32. Flue gas testers. F. O. H. BINDER. *Chem.-Ztg.*, **46,** 149–51(1922).—Descriptions with cuts, of (1) Schumacher's "Oekonometer," an app. in which the gas is weighed and the change in sp. gr. due to varying amts. of CO_2 is recorded on a chart as % CO_2; (2) Maihack's "Duplex-Mono," by which both the burned and unburned constituents of the gas are detd. alternately, the 1st by direct absorption and the 2nd by absorption after burning in a CuO furnace heated by electricity; (3) the "Union gas tester," which depends on the relative friction resistance of the gas and air when passed through a narrow tube. J. H. MOORE (*C. A.*)

33. 1920 Report of Committee on Pyrometer. W. E. FORSYTHE. *J. Optical Soc.*

Am., **5**, 494–512(1921).—F. redefines brightness temp., color temp., and some less used varieties of temp., gives simple working directions covering the whole subject of optical pyrometry, including construction and the avoidance of certain errors, and adds a brief record of the year's literature on the subject. W. P. WHITE (*C. A.*)

34. New graphic B.t.u. calculator. M. C. K. JONES. *Gas Age-Record*, **49**, 392–4 (1922).—A copyrighted diagram is shown by means of which lengthy calcns. are avoided in connection with lab. calorimeter tests. It may also be used to find correction factors for correcting gas vols. in routine lab. practice, in such tests as the estn. of H_2S, $C_{10}H_8$, CN, etc. It is based upon the general heating value formula. Observed B.t.u. = $[WT/0.2(B - A_t)(460 + 60)] \div [(30 - 0.517)(460 + t)]$, where W = wt. of H_2O heated, T = temp. rise of H_2O, B = barometer in in. Hg, A_t = tension of aq. vapor corresponding to temp. of gas, t = temp. of gas. J. L. WILEY (*C. A.*)

35. Brady B. t. u. indicator tests. O. L. KOWALKE. *Gas Age-Record*, **49**, 405–6 (1922); cf. *C. A.*, **14**, 338, 3781.—Tests were made to det. how accurately the heating value of gas could be measured and how to operate the instrument most effectively. Results were checked against a Sargent continuous flow gas calorimeter. It was found that the Brady app. has the tendency to read too low when the gas becomes richer and too high when the heating value drops from the point when the instrument was standardized. Diluents such as CO_2 and N_2 and combustibles like H_2 and CO have a marked effect on the indications of the instrument. It is not an instrument of precision but will give reasonable approximations when calibrated on a gas similar in heating value and compn. to that which is to be tested. J. L. WILEY (*C. A.*)

36. Brick-making in remote mining districts. H. C. ROBSON. *Mining & Sci. Press*, **124**, 187–91(1922).—Brick making in Siberia is described.

R. R. DANIELSON (*C. A.*)

37. Modern apparatus for the control of combustion and heating. LUCIEN MAUGE. *Bull. soc. encour.*, **133**, 1237–1321(1921).—A more extended discussion of matter treated by Berthelot, *Ceram. Abs.*, **1**, 34(1922). DONALD W. MACARDLE (*C. A.*)

38. Color classification of blast furnace slags. W. G. IMHOFF. *Blast Furnace Steel Plant*, **9**, 433–4(1921); cf. *C. A.*, **11**, 1622, 2877.—The purpose of this paper is (1) to furnish scientific data on "molten magmas" to the geologist and (2) to give the blast-furnace man a complete table of "color classification of blast furnace slags." It is professed to be the first attempt to classify slags scientifically. The analogy between slags and ordinary molten magmas and basaltic lava is emphasized. It is maintained that temp. and slag compn. are functions of one another. C. C. DAVIS (*C. A.*)

PATENT

39. Refractory cover for electric furnaces. MONROE S. CLAWSON. U. S. 1,410, 654, March 28, 1922. In combination with an elec. fur. including a crucible supported between heads, a carriage movable toward and away from the crucible, and a cover for the crucible formed of refractory material and supported by the carriage.

C. M. S., JR.

Chemistry, Physics and Geology

40. Regarding the accuracy of quantitative chemical analyses. E. SELCH AND R. GARSTENAUER. *Sprechsaal*, **54**, 432–43(1921).—The analyses were obtained of the same sand as in table which follows on page 202. Sample I was obtained from the mines while sample II was obtained from a customer. The presence of impurities in II is probably due to storage. Chem. analyses are seldom made which are more accurate than 0.01, and to state the chem. analyses in the third place is misleading. Errors due to impurities in the reagents, to incomplete chem. reactions and to

	I	II
SiO_2	99.85	98.60
Al_2O_3	0.05	0.331
ZrO	....	
Fe_2O_3	0.011	0.010
MgO	....	0.190
CaO	0.01	0.158
CuO	....	0.093
SO_3	....	0.082
S	....	0.018
Na_2O +	0.02	0.220
K_2O	....	.....
Loss on ignit.	0.10	.....
	100.041	99.70

inaccurate weighing would prevent an accuracy of more than one in the second place with the exception of analyses made by calorimetric methods.

H. G. SCHURECHT

41. Physical chemistry of the oxides of lead. III. Hydrated lead monoxide. SAML. GLASSTONE. *J. Chem. Soc.*, **121**, 58–66(1922); cf. *Ceram. Abs.*, **1**, 104(1922).—Expts. of previous investigators were repeated; none of the methods described yield substances having definitely the reported compns., 3 $PbO.H_2O$ or 2 $PbO.H_2O$. The products are either pure 5 PbO.2 H_2O or 8 PbO.3 H_2O or solid solns. of two or more simple hydrated oxides. It was not possible to decide between these alternatives but on the whole the data favor the former. The compn. of the ppt. from a Pb salt soln. by alkali depends on temp. and concn. of the precipitant, probably because of variation in the amt. of adsorbed water. Every prepn. examd. lost water on heating until decompn. set in at a point which was almost identical in every case (3.08–3.13% water). The dissociation const. of $H.HPbO_2$ produced by dissolving hydrated PbO in water was found by methods previously described to be 1.35×10^{-12} at 25°. The hydrated oxides have no appreciable vapor pressure; this and other properties are best explained by the assumption that they are salts of $H.HPbO_2$, *e. g.*, $Pb(HPbO_2)_2$. Attempts to prep. *Ag plumbite* gave a product roughly corresponding to $(AgHPbO_2)_2Ag_2O$. A. R. M. (*C. A.*)

42. A simple method for the determination of melting points and critical temperatures. W. HEIKE. *Z. anorg. allgem. Chem.*, **118**, 254(1921).—Note pointing out accuracy of 814.5– as m.p. of *arsenic*. G. L. CLARK (*C. A.*)

43. Zinc borate. T. C. N. BROEKSMIT. *Pharm. Weekblad*, **59**, 265–8(1922).—Zn is pptd. quant. in a gelatinous form by the mol. equiv. of borax soln. A. W. DOX (*C. A.*)

44. Economic mineralogy. J. A. HOWE. *J. Soc. Chem. Ind.*, **41**, 21–3R(1922).—An instructive address, illustrated by many examples which occurred during the war. Among important problems yet to be solved are: more efficient utilization of fuels, improvement in ore extn., and finding of uses for many minerals containing common or rare elements. L. W. RIGGS (*C. A.*)

45. Analysis of basic slag (citric-soluble P_2O_5). ANON. *J. S. African Chem. Inst.*, **5**, 16–19(1922).—Results obtained by different analysts for the citric-sol. P_2O_5-content of a prepd. sample of basic slag are tabulated for comparison. The official method and other methods were used. The official method consisting in extg. the sample with a 2% soln. of citric acid, pptg. of the P with molybdate, and subsequently with magnesia mixt. S. G. SIMPSON (*C. A.*)

46. Preparation of sols of silicic acid and tungsten hydroxide with the help of the Hildebrand cell. M. KRÖGER. *Kolloid-Z.*, **30**, 16–8(1922).—The sols were prepd.

by electrolyzing solns. of the Na salts using a Hg cathode. The current decreased steadily as the electrolysis progressed. After 2 hrs. electrolysis at 8v. the current in a 1.5% soln. of *Na silicate* (compn. not stated, probably approx. $Na_2O.3SiO$—Abstr.) had fallen to a min. (0.08 amp.). The resulting sol, which was neutral to litmus, set in 4 weeks. When a 6% soln. became neutral, it set rapidly to a clear gel. Hydrated SiO_2 sepd. on the anode and prevented further electrolysis of a 30% soln. The prepn. of a dark brown sol of *lower hydroxides of W* from a 2% Na_2WO_4 soln. was speeded up by the addn. of 0.1 *N* HCl. If any excess of acid were added, *W blue* was formed. A less stable gray sol similar to the brown one resulted when the Pt cathode in the electrolysis of acidified soln. of *pertungstates* was covered with a rubber diaphragm. *Hydroxides of Al, Cr,* and *Mo* pptd. during electrolysis in the *Hildebrand cell.* WM. STERICKER (*C. A.*)

47. The influence of tungstic acid on the gelatinization of silicic acid in strong hydrochloric acid solution. M. KRÖGER. *Kolloid-Z.*, **30,** 18–9(1922).—The *setting time of silica gels* formed by the mixt. of 9.77 *N* HCl and Na silicate soln. (33.7% SiO_2, % Na_2O not stated) was decreased by the addn. of a 10% soln. of $Na_2WO_4.H_2O$. The decrease was not proportional to the amt. of tungstate soln. added. W. S. (*C. A.*)

48. Electroadsorption as a purely chemical phenomenon. I. M. KOLTHOFF. *Kolloid-Z.*, **30,** 35–44(1922).—The adsorption of ions by solids (or the dispersed phase of suspensoids) is regarded as strictly a chem. reaction in which one ion of a very slightly sol. salt is replaced by another ion to form a second difficultly sol. salt. The process is strictly analogous to the exchange of bases in permutite. Freundlich's equation for the adsorption isotherm, $x/m = \alpha c^{1/n}$ (x/m is the amt. adsorbed per unit of adsorbent, c the final concn. of adsorbed ion in the soln., α and $1/n$ consts.) can be developed in which α depends upon the soly. products of the 2 difficultly sol. salts and $1/n$ is inversely proportional to the valence of the adsorbed ion. Data of Freundlich, Odèn, and the author are given to show that the values of $1/n$ for ions with valences of 1, 2 and 3 are as 1: $^1/_2$:$^1/_3$. F. L. BROWNE (*C. A.*)

49. Clay as an ampholyte. O. ARRHENIUS. *J. Am. Chem. Soc.*, **44,** 521–4(1922).—Clay, irrespective of its source, acts as an amphoteric electrolyte. The theoretical and practical importance of this is briefly discussed. H. JERMAIN CREIGHTON (*C. A.*)

50. New method for the volumetric determination of copper. S. MINOVICI AND A. IONESCU. *Bul. soc. chim. Romania,* **3,** 89–93(1921).—The method depends upon the pptn. of $Cu(NH_3)_4SO_4$ by the addition of 8 vols. of alc. to the concd. ammoniacal soln. and the titration of the ppt. with standard H_2SO_4 soln., methyl red being used as indicator. $Cu(NH_3)_4SO_4 + 2\ H_2SO_4 \longrightarrow 2(NH_4)_2SO_4 + CuSO_4$. W. T. H. (*C. A.*)

51. Methods of investigation at the Institute for Colloidal Research in Frankfort a. M. III. Investigation of preparations of colloidal silicic acid. ANON. *Chem.-Ztg.*, **45,** 1249–50(1921); cf. *C. A.*, **14,** 2574.—Prepns. of colloidal silicic acid which are sold for therapeutic use, such as in pulmonary tuberculosis, were investigated. The ultramicroscope furnished no information on the degree of dispersion of sols. of silicic acid. By the use of Kleinmann's nephelometer a relative value for the degree of dispersion was possible. Quant. relations were obtained by ultrafiltration. By this means the mixt. of differently dispersed particles was fractionated and compared with sols. of known degree of dispersion in order to obtain the abs. size of the particles.

H. M. MCLAUGHLIN (*C. A.*)

52. Heat transfer. W. H. MCADAMS AND T. H. FROST. *J. Ind. Eng. Chem.*, **14,** 13–8(1922).—Deals with conduction and convection only. Customary engineering formulas are often faulty; heat transfer is usually through 2 surfaces and a solid body and these 3 parts are differently affected by most changes of condition, hence they must be separately calcd. and not lumped together, as is often done. The leakage at a fluid-solid surface is conveniently treated by referring it to a *film* of the fluid, whose general

characteristics are discussed. New data are given showing the *properties* and *behavior* of this *film* for *condensing steam*. H. F. Weber's rule for the *thermal cond. of liquids* is tested for 13 liquids, and found consistent to 7%. W. P. WHITE (*C. A.*)

53. Rates of adsorption and heat transfer between gases and liquids. W. G. WHITMAN AND J. L. KEATS. *J. Ind. Eng. Chem.*, **14,** 186–91(1922).—The theory of the rate of transfer of heat and absorbable matter between liquids and gases is given, in which it is pointed out that this rate varies directly with the active vol., the driving potential, and the transfer coeff. These transfer coeffs. depend also upon the type of equipment and operating variables, such as gas velocity, liquor rate, etc. Exptl. values for these coeffs. were detd. on several types of equipment. From an economic standpoint, however, other factors must be considered in the design and operation of equipment.

E. N. B. (*C. A.*)

54. Reduced temperatures of transition and of fusion. J. NARBUTT. *Physik. Z.*, **21,** 341–9(1920).—A preliminary paper. By mathematical analysis several relations are developed concerning the phys. state of compds. With the various functions designated by symbols as follows: Θ = abs. temp. of transition or m.p. at the triple point; U_μ = the corresponding heat of fusion and transition; T = the abs. temp. chosen; A_T = free energy of transition; U' = heat of transition; U'' = heat of fusion; Θ' = temp. of transition; Θ'' = temp. of fusion; p_1 = vapor pressure of the solid; p_2 = vapor pressure of the liquid; $\phi = T/\Theta$; R = a const. in the well-known relation $A = RT \log p_2/p_1$ and S = the entropy, there are developed the following relations:
(1) $A'_{T'}/U'_{\Theta'} = A''_{T''}/U''_{\Theta''}$; (2) $U'_{T'}/U'_{\Theta'} = U''_{T''}/U''_{\Theta''}$; (3) $A'_{T'}/\Theta' = A''_{T''}/\Theta''$; (4) $U'_{T'}/\Theta' = U''_{T''}/\Theta''$; (5) $U_\Theta = [2\,R\Theta\vartheta/(1-\vartheta^2)] \times \log\,(p_2/p_1)$; (6) $\sqrt{p_2'/p_1'} = \sqrt{p_2''/p_1''}$; (7) $p_2'/p_1' = p_2''/p_1''$. $S''_{\Theta''}$ $S''_{\Theta''}$

C. C. DAVIS (*C. A.*)

55. Determination of surface tension from the rise in capillary tubes. S. SUGDEN. *J. Chem. Soc.*, **119,** 1483–92(1921).—In the detn. of surface tension from the rise in capillary tubes, it has been considered necessary to use a reference tube sufficiently large to give a plane surface. S. used two small tubes of different diameters and calcd. the surface tension from the difference in the heights of rise in the two tubes. The equation is $2\gamma[(1/b_1) - (1/b_2)] = Hg(D - d)$ where γ is the surface tension, b_1 and b_2 are the radii of curvature of the lowest points of the two menisci, H is the difference in level of the lowest points of the two menisci, g is the acceleration due to gravity and $(D - d)$ the difference between the density of the liquid and that of the surrounding medium. A table of corrections for use with this method is given and its use explained. The method is accurate to about 0.3%. The advantage of the method is that only small quantities of liquid are required. F. E. BROWN (*C. A.*)

56. The law of distribution of particles in colloid solution. E. F. BURTON AND MISS E. BISHOP. *Proc. Roy. Soc.* (London), **100A,** 414–9(1922).—After a Cu colloidal soln. was allowed to stand undisturbed for 50 days in a room which varied little in temp., the Cu was found to be uniformly distributed throughout the body of the liquid. These expts. indicate that the variation in concn. at different depths expressed in Perrin's distribution law must be confined to a very small distance at the surface.

H. M. MCL. (*C. A.*)

57. General conditions of the validity of the principle of Le Chatelier. A. J. LOTKA. *Proc. Am. Acad. Arts Sci.*, **57,** 21–37(1922).—By a general method of proof not depending on the laws of energy but only on considerations involving rates, it is proved that for isolated systems of const. mass the principle of Le Chatelier holds if the addn. of a small amt. of a component disappearing in the transformation of the system, or the subtrac-

tion of a small amt. of a component increasing in the transformation, increases the rate of the transformation. If the reverse is true, Le Chatelier's principle does not hold. This condition takes a somewhat more complicated form in case outside forces are active.

F. R. B. (*C. A.*)

58. Theory of adsorption processes. A. Eucken. *Z. Elektrochem.*, **28**, 6–16(1922). —A theoretical study and mathematical analysis of adsorption phenomena and adsorption curves. This method offers a commensurate and direct means of ascertaining the action between different mols. The results of Langmuir's investigation of the adsorption of gases by glass, mica and Pt (cf. *C. A.*, **12**, 2152) are discussed at length.

H. Jermain Creighton (*C. A.*)

59. A new iodometric method for the determination of copper. R. Lang. *Z. anorg. allgem. Chem.*, **120**, 181–202(1922).—The usual iodometric detn. of Cu depends upon the reduction of Cu by iodide and titration of the I_2 that is liberated. The new method depends upon the oxidation of $Cu_2(SCN)_2$ by standard I soln. and titration of the excess of I with $Na_2S_2O_3$, the cupric ions being removed by the formation of Cu-oxalate complex which is not reduced by iodide under the prevailing conditions. Two methods for carrying out the analysis are described. (1) To the soln. contg. not more than 0.28 g. Cu and a little mineral acid, add an excess of H_2SO_3 and of 0.1 *N* KCNS until all the Cu is pptd. as $Cu_2(CNS)_2$. Boil off the excess SO_2, cool, add 120–150 cc. of an oxalate mixt. prepd. by mixing 5 vols. of 0.32 *N* $(NH_4)_2C_2O_4$ and 7 vols. of 0.95 *N* $H_2C_2O_4$ and dil. to about 400 cc. While rotating the contents of the Erlenmeyer flask, add 0.1 *N* I soln. until the cuprous ppt. is entirely dissolved and then titrate the excess of I_2 with $Na_2S_2O_3$ soln. (2) To the Cu soln. in a long-necked flask, add NH_4OH until ammoniacal and discharge the color with 0.5 *N* KCN soln. Add 1 g. of NH_4CNS and, while cooling, make the soln. acid with 0.95 *N* $H_2C_2O_4$ soln., which causes the pptn. of $Cu_2(SCN)_2$ to be analyzed as in Method 1. Method 1 is applicable in the presence of all cations which are not reduced to metal by H_2SO_3. Method 2 is applicable in the presence of all other metals with the following modifications: *Ag.*—The pptn. of AgI tends to prevent the dissolving of the $Cu_2(SCN)_2$ so that the contents of the flask should be shaken a long time before titrating the excess of I_2. *Hg.*—In many cases it is necessary to add additional NH_4CNS to dissolve HgI_2. *Pb.*—The pptn. of $PbSO_4$ is prevented by $AcONH_4$ and by using AcOH instead of $H_2C_2O_4$. First add Rochelle salt to the Cu soln., make strongly ammoniacal, decolorized with KCN, add NH_4CNS and acidify with AcOH. *Bi.*—Proceed as with Pb but acidify with oxalic acid and shake well before the final titration. *As.*—Acidify with AcOH. *Sb.*—Make the soln. strongly ammoniacal, add $(NH_4)_2C_2O_4$ or $Na_4P_2O_7$ and heat to convert the quinquevalent Sb into a sol. complex. Then proceed as with Cu alone. *Co.*—After the decolorization with KCN boil to decompose the H_2O_2 formed during the production of the complex $Co(CN)_6^{---}$. *Mn.*—Instead of adding NH_4OH, it is necessary to add Rochelle salt or $(NH_4)_2C_2O_4$ to prevent pptn. of $Mn(OH)_2$ and to avoid an excess of KCN. *Ba, Sr, Ca* and *Mg* may give ppts.; these will not form, however, if an excess of Rochelle salt is used instead of NH_4OH and AcOH is used instead of oxalic acid; the soln. should be well shaken before the final titration.

W. T. H. (*C. A.*)

60. Volumetric and gravimetric determination of zinc. S. Urbasch. *Chem.-Ztg.*, **46**, 97–99, 101–3, 125–7, 133–4, 138–9(1922); cf. *Ceram. Abs.*, **1**, 174(1922).—As a result of a critical study of the various methods commonly used for the detn. of Zn, the following procedure is recommended: Treat 1.5 g. of the finely powdered ore in a 300-cc. beaker with 20 cc. of concd. HCl. Heat until disintegrated, add 3 cc. or less of concd. HNO_3 and again heat. Add 16 cc. of 18 *N* H_2SO_4 and heat on the sand bath until nitrous fumes are all expelled and most of the HCl is evapd. Add HF drop by drop until the SiO_2 gel is all dissolved and then evap. to fumes. Cool, add 60 cc. of water and digest about 15

min. at 60–70°. Sat. with H_2S, filter and wash with a mixt. of 80 cc. hot water, 2 cc. 18 *N* H_2SO_4 and 20 cc. of satd. H_2S soln., using this wash liquid in 10–15-cc. portions. The filtrate should not exceed 180 cc. Boil off H_2S, adding a little coarse sand to prevent bumping. Add 3–5 cc. of H_2O_2 to oxidize the Fe and heat 5 min. to remove excess of oxidizer (if Mn is present add 0.5–2 g. of Br. and shake). Add 20 g. NH_4Cl and an excess of NH_4OH. Make up to exactly 300 cc., filter and use 100 cc. of the filtrate (0.5 g. of ore). Evap. gently until all the NH_4OH is expelled, add 1 drop of methyl orange and neutralize carefully with HCl. Heat to boiling, dil. to 150 cc., add 3 cc. of $FeCl_3$ soln. contg. 0.1 g. of Fe per 1. and titrate the hot soln. with $K_4Fe(CN)_6$ until the blue color changes to white, and then titrate back to a pale blue with standard Zn soln. In the study of the gravimetric detn. of Zn, no attention was paid to the detn. as phosphate. The expts. showed, however, that it is possible to ppt. Zn quant. as ZnS from a soln. originally neutral and contg. as much as 3.1 g. of $ZnCl_2$ or 7.5 g. of $ZnSO_4$. If the soln. contains 1 cc. of *N* HCl per 100 cc. and from 0.15 to 0.2 g. of Zn the pptn. as ZnS is quant. and the ppt. easy to filter. The presence of NH_4 salt appeared to retard the pptn. Satg. with H_2S in the cold and then heating the stoppered flask to about 40° served to aid pptn. The presence of Al retarded the pptn. of ZnS but pptn. in the presence of HCOOH seemed to be favorable as has been found by others. W. T. H. (*C. A.*)

61. The form of silicon: Solubility of silicon in hydrofluoric acid. W. MANCHOT AND H. FUNK. *Z. anorg. allgem. Chem.*, **120**, 277–99(1922); cf. *C. A.*, **16**, 1055.—Alloys of Al-Si were prepd. in the form of reguli by heating Al with K_2SiF_6, and dilg. with Al, or by direct fusion of Al and Si. Samples were then heated to various temps. for 15–20 min., and one series allowed to cool in the furnace as slowly as possible, another series being poured into H_2O to secure instant cooling. Al was dissolved out by HCl, the residue dried at 80° and weighed, giving the % of Si, and the latter then treated at 120° with 40% HF in a closed Pt vessel, with side tubes for introducing CO_2 and for carrying off the H evolved. Detns. of H showed that from 1.9 to 47.5% of the theoretical vol. of gas was formed, based on the % of Si in the sample, when the melts had been quickly cooled, and that only from 0 to 6.5% of the theoretical vol. of H came from slowly cooled samples. The latter were graphitic, and bluish gray, the single crystals being steel blue or slate blue, and yellowish brown in thin sections by reflected light. The quickly cooled samples were blackish gray, with a brownish tone, and showed no crystn. with a magnification of 960 diams. In water some of the particles showed the Brownian movement, having a diam. of 1 μ or less. A few quickly cooled specimens showed incipient crystn., probably due to the fact that the quenching was occasionally delayed slightly. Melts contg. less than 10% of Si gave more H than more concd. melts. Heating to different temps. had little effect. Very fine pulverizing of both sorts of Si caused a slightly increased H vol., but when the crystd. variety was reduced to particles about 1 μ in diam., the action of HF was still slight. No samples were completely sol. in HF. Amorphous Si left a brown residue which was only slightly attacked on subsequent exposure. All 3 varieties were also slightly attacked by H_2O, the amorphous samples giving up to 1.1% of H, and the crystd. samples only traces. The insol. residue from the amorphous variety was a very reactive brown powder, burning when heated in air or O, igniting with fuming HNO_3, Cl and Br, and giving H with dil. NaOH. This behavior is due to traces of occluded H, which can be driven off at a dull red heat, leaving a dark residue which resumes its brown color on cooling, but which has lost its reactivity. Heating *in vacuo* gave 32–44 cc. of H per g. The brown variety is best prepd. from melts contg. 10% of Si. D. of a quickly cooled sample 2.23, d. of brown variety 2.2, d. of crystd. variety 2.3. The best method for the *detn. of Si content* was found to be measurement of the H evolved on treatment with boiling KOH soln., the gas being driven over by CO_2. Amorphous samples contained 75–88% of Si, some-

what less than the crystd. variety, and slightly more SiO_2, produced by removing the melts from the furnace and quenching. The residue after treatment of the amorphous Si and HF also contains some SiO_2, evidently produced by cyclic reactions involving SiF_4 and H_2O. When 25 g. of crystd. Si was treated 21 times for 4 hrs. each with HF, the wt. was reduced to 2 g., the crystals lost their luster, and the residue was an almost amorphous powder, which, however, under the microscope still showed crystal forms. Consequently even crystd. Si is slowly but practically completely sol. in HF. Moissan and Siemens (*Ber.*, **37**, 2540(1904)) prepd. crystd. Si from Ag melts, which was 99% sol. in HF, and formed thin yellow transparent or translucent plates. But M. and F, found that black crystd. Si from slowly cooled Ag melts gave very little H with HF, while quenched Ag melts gave completely amorphous Si which easily evolved H. M. and S. state also that the rapidity of cooling has no influence on the yield of Si sol. in HF, and do not appear to have noted that H is formed. Their high Si contents were probably due to their method of analysis, which consisted in dissolving the samples in 10% KOH and weighing the SiO_2 formed, no statement appearing as to a correction for the SiO_2 already present. M. and S. apparently did not prep. the amorphous Si formed in rapidly cooled Ag melts. To test M. and S.'s statement that melts containing not more than 2% Si gave a product completely sol. in HF, 2 melts containing 2 g. of pure Si and 50 g. of Ag were prepd., heated to 1500°, one of them cooled slowly, and the other poured in H_2O. Each gave, after soln. of Ag in dil. HNO_3, 0.5 g. of Si. That from the quenched melt was a very voluminous brown powder, showing no crystn. under a magnification of 960, and agreeing in properties with that prepd. from Al melts. The slowly cooled melt gave a much less voluminous gray, cryst. powder. Heated in HF for 1 hr. at 120°, the amorphous Si, 70% pure, gave 15.1% of H, while the cryst. powder, 85.2% pure, gave only 8.2% of H. Expts. with Zn and Pb melts (with O. KÖHLER) also gave amorphous Si which was more reactive than the slowly cooled cryst. form, but the amt. of H evolved with HF was relatively lower than in samples formed in Al or Ag melts, owing to the lower soly. of Si in Zn and Pb, which favors crystal formation even with rapid cooling. Si prepd. by Kühne's method from SiO_2, Al and S, after treatment with boiling HCl to remove Al, was crystd. and gave only 2.7% of H. Technical massive Si gave 3% of H when quenched in H_2O from 2000°, and 2.1% when slowly cooled, and similar results were obtained with pure Si, all the samples being crystd. after cooling. Amorphous Si, both before and after treatment with HF, can be changed into crystd. Si by soln. in Al. So-called "amorphous" Si prepd. by reduction of quartz with Mg gave very little H, and the microscope showed it to be cryst. M. and F. conclude that their amorphous Si is not an allotropic modification, but is an extremely finely divided form of crystd. Si, which cannot be produced by mech. means, although it can be approached by fine grinding. The brown amorphous variety, which is resistant to HF, is thought to possess a kind of passivity due to the occluded H. M. R. SCHMIDT (*C. A.*)

Refractories and Furnaces

62. Apparatus for the determination of deformation of refractories under load. DR. W. STEGER. *Ber. der. Deut. Keram. Gesellschaft*, **31** (1922).—The writer reviews previous methods of testing refrac. under load and describes his app. This app. is independent of the fur. and is portable. Heat is obtained elec. and the expansion or contraction of the specimen is recorded automatically. R. F. G.

63. Silica brick of constant volume. O. REBUFFAT. *Trans. Ceram. Soc.*, **21**, Pt. 1, 66–68(1921–1922) (R. Rieke).—The writer gives data showing effect of small percentages of P_2O_5 on the inversion of quartz to tridymite. It is shown that 0.31–0.45% P_2O_5 is sufficient to effect a lowering of the sp. gr. from 2.65–2.60 to 2.25–2.30 in a single burn of 8 hours at 1300–1350°C. R. F. G.

64. Behavior of refractory brick under load at high temperatures. Dr. K. Endell. *Trans. Ger. Ceram. Soc.*, **2,** 73(1921).—Cylinders of refrac. material 2″ diam. and 2″ high are heated to 1700°C in an elec. resist. furnace and pressure is applied by means of a suitable lever arrangement. Four different types of refrac. tested in this way compare as follows: 1. *Clay Brick*—Initial softening point about 1300° C. If plastic clay content is high may be lowered to 1150° C. 2. *Magnesite Brick*—Initial softening point about 1500° C. 3. *Silica Brick*—Short softening range commences about 1650° C and shortly thereafter collapses, whereas magnesite brick even at 1700° C. still shows a certain degree of stability. 4. *Carbon brick*—No signs of softening up to 1700° C.

F. A. Whitaker

65. The development of a new refractory. A. F. Greaves-Walker. *J. Soc. Chem. Ind.*, **41,** 13–14T(1922).—Quantity production of sillimanite brick has already commenced. Analysis of brick is: SiO_2, 6.32; Al_2O_3, 86.10; Fe_2O_3, 1.17; CaO, 0.60; alkalies 1.10; TiO_2, 4.53%. Pure sillimanite is 37 SiO_2, 63 Al_2O_3 with fusion temp. at 1816°. The brick compare favorably with SiC under the same conditions.

R. R. Danielson (*C. A.*)

66. Retorts for zinc ores. J. P. Varian. *Eng. Mining J.*, **113,** 363(1922).—V. recommends sizing of grog to minimize voids. Each grain of grog must be coated with a thin film of clay and to accomplish this the clay is soaked with H_2O in a large tank to form a thin mud. The tank should have a mixing device and sized grog should be added in definite amts.

R. R. Danielson (*C. A.*)

67. The determination of the thermal conductivity, specific heat, density and thermal expansion of different rocks and refractory materials. Y. Tadokoro. *Science Repts. Tôhoku Imp. Univ.*, **10,** 339–410(1921).—This extensive report covering 109 specimens of Japanese and Asian rocks and refractory materials contains 18 tables and 45 figures. For detg. the thermal cond. the test-specimen is periodically heated and cooled and the penetration of the temp. wave into the interior measured, the diffusibility being calcd. by means of Fourier's series. A purely sinusoidal heat source was devised using a variable resistance in a plectrum form. This and the methods for the other properties are described in great detail. The cond. increases with content of magnesia, but decreases with that of silica, lime and alumina. Densities are calcd. from the coeffs. of expansion. Silica bricks are most suitable for installation of a reservoir of heat, the temp. of which is required to rise as quickly as possible when hot gas comes into it, and to cool quickly when cold air comes in. Chamotte bricks are most suitable for thermal insulation.

G. L. Clark (*C. A.*)

68. New seven-ton Heroult furnace. Anon. *Iron Age*, **109,** 325(1922).—The furnace described departs from the standard types, in that the lift of the electrodes is extremely high and makes possible the use of mech. charging devices.

Louis Jordan (*C. A.*)

69. Acid open-hearth process for manufacture of gun steels and fine steels. W. P. Barba and H. M. Howe. *Trans. Am. Inst. Mining Eng.*, sep. No. **1114-S,** 39 pp. (1922); *Blast Furnace Steel Plant*, **10,** 183–91.—Report of the Committee on Steel Ingots of the Engineering Division of the Natl. Research Council. The paper is a detailed description of the best practice in steel melting and ingot production. It was prepared in order that the number of efficient makes of steel for guns, shells, crankshafts and other forgings might be increased to meet gov't needs in 1918. Publication has been delayed. Reasons are given for each step recommended for the production of sound, clean and uniform ingots of proper structure and for prolonging the life of the furnace. The report is a concise manual which will be of great value to all who wish to make fine steel. Means for restraining segregation, columnar crystn., retention of inclusions, and for preventing internal and external cracks or flakes are given. The advantages of cool

over hot pouring are stated. Ingot mold design is treated in detail. The reasons for the use of top or bottom pouring are clearly stated. The time-temp. diagram on p. 8 and the ingot mold data on pp. 31–39 are important parts of this excellent manual.

JAS. O. HANDY (*C. A.*)

70. Reduction of fuel wastes in the steel industries. F. G. CUTLER. *Mech. Eng.*, **44,** 237–8(1922).—Formulas are given for the calcn. of blast required and gas obtainable in the iron blast-furnace operations. The volume of gas possible = 71.4 *R*, in which *R* is lbs. of coke per t. of pig iron, the B.t.u. value of the gas = 62.5 ÷ 0.0165 *R* and the cu. ft. of air per lb. of coke = 51.4 *R*. The wastes such as the gas and coke braize are utilized at the plant. The gas from the furnace is burned under the boilers and used for the heating of the stoves, the gas from the coke plant is sold and the tars and oils recovered are used as fuel for the open-hearth furnaces, the coke braize is used as a cover for the molten metal when being transported from place to place about the plant. A heat balance for the manuf. of 1 t. pig iron is outlined which shows a total of 17,375,000 B.t.u. required. W. A. MUELLER (*C. A.*)

71. Zirconium and zirconium oxide. L. ANDRIEUX. *Industrie chimique*, **8,** 478–81 (1922).—A review of the occurrence, properties, and applications of ZrO_2, and of the prepn., properties, and applications of Zr, with a bibliography of 21 references.

A. P.-C. (*C. A.*)

72. Calculation of working temperature in metallurgical furnaces. HUGO BANSEN. *Stahl u. Eisen*, **42,** 245–53, 291–7, 370–5, 423–6(1922).—The ratio of the actual working temp. of a furnace to that calcd. from the heat input and the heat capacity and temp. of the products of combustion is 0.65–0.80°. For the heat to be transferred from the flame to the work a temp. difference of 50–300° is necessary. R. S. DEAN (*C. A.*)

73. The present status of electric furnaces in steel making. HARRY ETCHELLS. *West Scotland Iron & Steel Inst.*, **29,** part 2, 2–12(1921).—A review. The many advantages of elec. steel are emphasized. Discussion by Jefferson, Sharpe, *et al.*

C. G. F. (*C. A.*)

74. Aluminium. P. H. SAMPELAYO. *Bol. del. inst. geol. de España*, **41,** 3(1921); *Bull. Imp. Inst.*, **19,** 233–6.—Various deposits of bauxite are described. The bauxite problem in Spain is still under investigation. The % of SiO_2 is high so that the mineral can be used only for obtaining $Al_2(SO_4)_3$, as a refractory or as a building stone. A typical analysis is: SiO_2 9.40, TiO_2 0.96, Fe_2O_3 7.0, Al_2O_3 68.19, CaO 0.4, MgO 0.10, loss 14.10%. R. L. SIBLEY (*C. A.*)

75. A new electric muffle furnace for temperatures up to 1700°. K. ENDELL. *Z. angew. Chem.*, **35,** 31(1922).—The oven is 285 × 185 × 110 mm. inside, uses a.c. or d.c., can be heated to 1700° in 2 hrs. and held within 10° of any desired temp., the temp. is uniform, the power required is 5–16 kw., and repairs are easily made.

J. H. MOORE (*C. A.*)

76. Laboratory furnace for deformation temperature of refractories. L. R. OFFICE. *Chem. Met. Eng.*, **25,** 162–3(1922).—A small pot furnace is described with drawings. Natural gas at $2^1/_2$ lbs. and preheated air at 25–30 lbs. pressure will give cone 35 in 45 min. The preheater and burner are the special features. R. J. MONTGOMERY (*C. A.*)

77. American coking practice. J. W. LEE AND G. A. HEBDEN. *Iron & Coal Trades Rev.*, **104,** 310–11(1922); *Gas World*, **76,** No. 1963 (Coking Sec.), 10–14.—An account of a 2-months' tour in the U. S. visiting 25 coking plants. J. L. W. (*C. A.*)

78. Refractories source of troubles. M. L. MORRISON. *Foundry*, **50,** 33–5(1922). —The blow holes in cast iron attributed to overheating may, in some cases, be caused by the decompn. by water present in the molding sand of carbides of Al and Ca formed by reactions between the melt and the refractories. Careful selection of the refractories used in the cupola lessens this damage. F. P. FLAGG (*C. A.*)

PATENTS

79. Refractory brick. GEORGE A. BALZ. U. S. 1,410,729, March 28, 1922. A refrac. brick consisting of a body portion and a facing portion rel. shaped to mech. engage one another and united only by such engagement. C. M. S., JR.

80. Refractory brick. J. A. WRIGHT. Can. 215,847, Feb. 14, 1922. Refractory bricks are made from natural deposits of chromite and serpentine rock by crushing, agitating with slight moisture to distribute the serpentine particles evenly throughout the chromite and then burning in a kiln. (*C. A.*)

81. Electric furnaces. A. E. REID. Can. 215,822, Feb. 14, 1922. A furnace especially adapted for making *carbide* has an outlet in the furnace chamber which is kept in its open or delivering condition by passing current through an electrode placed in the outlet. Means for feeding a charge to the furnace and electrodes for delivering current to the charge are provided. (*C. A.*)

82. Refractory composition. DANIEL ELIJAH COLLINS. U. S. 1,411,842, April 4, 1922. A refrac. bonding and glazing compn. comprising fire clay, a hydraulic cement and a metallic sulfide. C. M. S., JR.

Stoneware, Whiteware and Porcelain

83. Making of stanniferous faience. ALIX. CORNILLE. *Rev. Mat. Constr. Trav. Pub.*, **150**, 35B–38B(1922).—General description of the body and glazes from the points of view of compn. making, and burning, for faience containing tin oxide. The body is usually a mixt. of clay, an argillaceous marl, and an argillaceous or calcareous sand. Compn. limits are SiO_2 55–65%, Al_2O_3 13–20%, Fe_2O_3 2–4%, MgO CaO 13–25%, KNaO 2–4%. A lime content less than 14% gives rise to cracking, that higher than 22%, to scaling and staining. The propn. of lime is influenced by the content of other bases, *i. e.*, MgO, alkalies and Fe_2O_3; their presence necessitating a decrease in CaO. Also the higher the temp. of burning the lower should be the lime content. A glaze corresponding to $\left.\begin{matrix}0.59\ PbO\\0.40\ Na_2O\end{matrix}\right\}$ 0.15 Al_2O_3, 0.26 SnO_2, 2.45 SiO_2 will stand cone 011. For colored glazes, a mixt. of 1 part of tin glaze and 4 parts of transparent glaze is used as the base, the coloring oxides being added or fritted to the one or the other as the case may require. The formula of the clear glaze is

$$\left.\begin{matrix}0.2\ KNaO\\0.1\ CaO\\0.65\ PbO\end{matrix}\right\}\ \left.\begin{matrix}0.2\ B_2O_3\\0.1\ Al_2O_3\end{matrix}\right\}\ 1.1\ SiO_2$$

A clear *tin-less opaque glaze* with which good results have been obtained corresponds to the formula

$$\left.\begin{matrix}0.8\ RO\ (Pb, Ca, Mg)\\0.2\ R_2O\ (K,Na)\end{matrix}\right\}\ \left.\begin{matrix}0.22\ B_2O_3\\0.07\ Al_2O_3\end{matrix}\right\}\ 2.08\ SiO_2$$

LOUIS NAVIAS

84. Testing porcelain, kaolin and clay for whiteness. DR. W. FUNK, *Trans. Ger. Ceram. Soc.*, **2**, 39(1921).—The nearest approach to a "standard white" surface which reflects 100% of the light rays can be prepd. from precipitated barium sulphate. For comparing "whites" a "grey" scale of color strips ranging from "standard white" to black is described. This scale is in the form of a long stencil strip with cut-outs between the bands of shades and can be placed over the piece until the shade of the test-piece corresponds with that of the strip. Percentage of "white" in a yellow tinted piece can be determined with the same scale if filtered light is used. Percentage of "white" in porcelain ranges from 70 to 95%. F. A. WHITAKER

85. Handling Equipment. U. SAUER, *Trans. Ger. Ceram. Soc.*, **2**, 66(1921).—Describes advantages of monorail system and gravity elevator for handling raw and finished materials, also a portable conveyor for handling saggers in and out of kilns.
F. A. WHITAKER

86. High fire porcelain glazes. H. H. SORTWELL. *Brick and Clay Record*, **60**, 622–625(1922). H. G. SCHURECHT

87. Comparison of cold glazes and cold glazed tile with ceramic wall tile. C. TOSTMAN. *Ber. der Deut. Keram. Gesellschaft*, **3**, Pt. 1, 31(1922).—T. gives short résumé of patents on cold glazes and of previous lab. tests of this material. Objects to term *glaze* for this product which is composed of Portland cement, color and a lime soap. The tile are prepared by coating a concrete base with this paint. T. gives detailed description of tests and data obtained by detn. of porosity, resistance to freezing, transverse strength, impact test, resistance to chem. and hardness of glaze on both the concrete and ceramic wall tile. The ceramic tile were the usual product of white burning body and translucent glaze. From his own and previous exp. the writer concludes that the cements are a possible substitute for common oil paints as a wall covering but that they are inferior to ceramic tile in every way. The writer expresses his fear that the cheapness and ease of manuf. of this substitute product will lead to its being placed on the market in such quantity as to hurt the wall tile industry. R. F. G.

88. The testing of porcelain. DR. R. RIEKE AND DR. M. GARY. *Ber. der Deut. Keram. Gesellschaft*, **3**, Pt. I, 5(1922).—Growing importance of tests is noted and history given of the formation of a committee, as a branch of the Ger. Soc. of Testing Materials, for the adaptation of standard tests to the study of porcelains (especially elec. porcelain). Detailed descriptions of tensile, ball compression (cold), transverse and impact bending tests are given together with a tabulation of results obtained on eight porcelains. The reliability of the tests are calcd., their comparative value as means for differentiating porcelains found, and the conclusion reached that the ball compression test be further developed as a means for classifying elec. porcelains. Absorption tests (American method of dye penetration) produced no positive results but a modified method was adopted because of the use of this test in other countries. Porosity (both open and closed pores) and the microscopic structure of the eight porcelains were also studied. It was found that altho no definite reln. existed between mech. strength and microscopic structure there was sufficient connection to warrant further study in order that microscopic analyses might be established as a definite and simple means of classifying porcelains. R. F. G.

PATENT

89. Ceramic insulating material. JOSEPH A. JEFFERY. U. S. 1,409,953, March 21, 1922. The raw batch of a ceram. material comprising a mixt. of sillimanite, a flux and a clay mixt., the clay content, when heated by itself, maturing at the temp. at which the ceramic body matures. C. M. S., JR.

Art and Design

90. A proposed standard method of colorimetry. H. E. IVES. *J. Optical Soc. Am.*, **5**, 469–78(1921).—A spectrophotometric method of color measurement is suggested, which consists in measuring adjacent patches of the spectrum, each patch being of width inversely proportional to the hue perception sensibility of the eye at that point and so narrow that no significant color difference can enter because of differences of intensity distribution in the spectra of the compared colors. The advantages over the 3-element methods or other spectrophotometric processes are discussed. As an instrument the principle of the Maxwell color box is used, with specially designed slits. Light from the surface whose color is to be measured, and from a standard white surface under

the same illumination passes through the special slits and 2 lenses placed at their focal distances from the slits. Next is placed a compound photometric prism designed to reflect the light from one lens through one part of the field as viewed by the eye of the observer, and light from the other lens through another part, the dividing edge being as fine as possible. Finally, in order, are a dispersing prism or grating, telescope lens, and narrow viewing slit. To make a photometric match a variable aperture sector is placed before the white-light slit, and the process of making a measurement consists in isolating the successive monochromatic patches, and for each one varying the sector transmission until photometric match is obtained. The method of plotting the results and of reproducing the measured color by a spectrum template disk are fully discussed.

G. L. CLARK (*C. A.*)

91. The use of secondary reference standards in process problems of color measurement. H. S. BUSBY. *Proc. Am. Soc. Testing Materials*, **21**, 1139–53(1921).—A *colorimeter* is described which uses rotating sectors of suitable standard colors or white, similar to the Howland color photometer (*C. A.*, **10**, 2164), but in which the abs. or relative areas of the sectors may be varied or read off while the machine rotates. Color matches may, therefore, be made very rapidly; duplicate measurement agree within sector areas to 0.1% of the total sector circle. For commercial work, secondary reference standards are sufficiently accurate and more easily applied than fundamental standards.

F. A. WERTZ (*C. A.*)

92. Dark colored pipe from fire clay. ANON. *Brick and Clay Record*, **60**, 546(1922).—To aid in bringing about the dark colored pipe alternating oxidizing and reducing conditions should be used. A dull black glaze has been made by mixing crude oil with the salt. The fire immediately before salting should be clear and bright. After the salting the kiln should be fired with reducing conditions, and then oxidizing before salting again. If this scheme is followed several times it facilitates the formation of desirable dark glazes.

H. G. SCHURECHT

93. Battle of the bricks. ANON. *Brick Pottery Trades Jour.*, **30**, 84(1922).—It is claimed by G. Skipper that houses where masters of architecture are found are made with unburned brick since they make the house warm and dry. A. B. Searle questioned the above statements and thinks burned brick are better than unburned.

H. G. SCHURECHT

94. Some ways of reducing the cost. ANON. *Clay Worker*, **77**, 40–42(1922).—Time saving devices for handling the crude clay and ware are described.

H. G. SCHURECHT

95. Paving brick variety simplified. ANON. *Clay Worker*, **77**, 38(1922).—The National Paving Brick Manuf. Assn. in coöperation with Depart. of Commerce of the U. S. and through conference with a number of organizations has been eliminating useless sizes and varieties in paving brick and simplifying standards reduced to the smallest practical number. The varieties to be retained are as follows: Plainwire-Cut Brick, Repressed Lug Brick, Vertical Fibre Lug Brick, Wire-Cut Lug Brick, and Hillside Lug Brick.

H. G. SCHURECHT

96. Preference for asphalt filler for brick pavements for general use is announced. ANON. *Clay Worker*, **77**, 38(1922).—The N. P. B. M. A. adopted asphalt filler for general use as a filler for brick pavements.

H. G. SCHURECHT

97. The determination of the porosity and resistance of clay ware to acids. O. KALLAUNER AND J. FISER. *Sprechsaal*, **54**, 412–422(1922).—The results of porosity and acid tests on 25 different ceram. bodies are given as detd. by different methods.

H. G. SCHURECHT

98. The use of $BaFl_2$ to prevent scumming. ANON. *Sprechsaal*, **54**, 547–548(1921).—Reference is made to Lovejoy's and Staley's work in *Trans. Amer. Ceram. Soc.*, **8**,

255, 17, 200. Using $BaFl_2$ in the place of other barium salts is cheaper, is more sol. than $BaCO_3$, the necessary amt. is the same or less, it does not affect the color of the fired ware, an excess does not cause scumming and it facilitates the vitrification of the mass. H. G. SCHURECHT

99. Burning with oil in Haigh kiln. HAIGH. *Brick and Clay Record*, **60**, 546–547 (1922).—The saving in fuel depends on the cost of fuel oil. Whether it is cheaper than coal or not depends on where it is being used and how cheap oil is compared with coal. The Phenix Clay Corp. use 14 gals. per 1000 brick. The Salmon Brick & Lumber Co., Slidell, La., use $52^1/_2$ gals. per 1000 brick and fire to cone 14, but they top fire with 70 bs. of fine coal per 1000 brick. H. G. SCHURECHT

100. Scumming, efflorescence and whitewash. ANON. *Brick and Clay Record*, **60**, 602–606(1922).—The causes of scumming may be (1) sol. salts in weathered clay, (2) minerals in unweathered clay which decompose, (3) sol. salts in tempering water, (4) sulphur in lubricating oils, (5) sulphur in kiln gases used for dryer heating, (6) slow drying, (7) condensation in dryer, (8) decomposition of sulphur minerals in clay during burning, (9) sulphur from fuel uniting with lime in clay, (10) condensation during water-smoking period, (11) storage on cinders or damp soil, (12) soaking of brick wall and reëlaboration, and (13) action of rain and sol. salts from mortar.

Suggestions for preventing white wash are (1) use freshly mined unweathered clay, (2) weather clay thoroly to enable washing out of sol. salts, (3) be careful as to tempering water, (4) use barium compds. to ppt. sol. salts, (5) dry ware rapidly, (6) prevent condensation in dryer, (7) do not use sulphurous gases in dryer, (8) water-smoke ware uniformly with good draft, (9) use a low sulphur fuel, (10) burn with alternating reducing and oxidizing conditions, (11) coat brick with coal tar or wheat flour, (12) burn brick hard and make impervious, (13) store brick on planks and (14) be careful in use of mortar. H. G. SCHURECHT

101. Schinkel's Berlin brick buildings. H. MACKOWSKY. *Tonind. Ztg.*, **46**, 307–309(1922).—M. describes various types of brick buildings built by Schinkel. H. G. SCHURECHT

102. Observations on burning. J. P. WILLIAMS. *Clay Worker*, **77**, 34–35(1922).—Two types of continuous kilns are described, one in which the fire moves and the ware remains still and the other in which the ware moves and the fire stands still. The ones in which the fire moves are divided into two classes, the compartment type and the tunnel type. The moving ware kiln is divided into two classes, one with a muffle and one without a muffle or what is called direct fired. The moving fire type of kiln is cheaper than the compartment type and the latter is considered better than the tunnel type, although in some of the kilns of the Hoffman type, in which the ware is fired from both top and sides, they get very good results, with but few light brick and over burnt ones. The German and English Hoffman kilns are commonly used in this country and are the best types of the straight tunnel kilns, and by far the cheapest to build, and their operating cost is about on a par with the compartment type. The prevailing type of compartment kiln used in this country has been that of the German Mendheim, and also those of P. L. Youngren. The moving fire type of kiln is becoming out of date, and a moving ware kiln will take about 10–15% less coal than the moving fire type. Also a much larger amount of ware is tied up in the kilns of the moving fire type which is expensive. Of the moving car type the muffle kilns are used for ware having a short burning range, as brick and tile, while direct fired kilns are used for wares having a larger burning range as pottery and refractories. H. G. SCHURECHT

103. Automatic stokers in brickwork. ANON. *Brick Pottery Trades Jour.*, **30**, 80(1922).—Automatic stokers for boilers are invaluable when the boilers are sufficiently large or sufficiently numerous to warrant them. Unfortunately, there is a difference of

opinion among engineers as to the smallest boiler for which it pays to install an automatic stoker, but it is generally agreed that they offer no advantage for plants of less than 150 h.p., and should not usually be installed for plants of less than 500 h.p., so that few brickworks can use them to advantage. In large power installations they are invaluable, and save at least 10% of fuel. Those brick works which profit by the use of automatic stokers do so because they enable a very poor quality of coal slack to be used which could not be employed for hand-fired boilers as the fires would require too much attention. The rate of combustion should be adjusted so that the automatic stoker gives the best results obtainable with the available coal. Sometimes, by increasing or reducing the rate of combustion, the efficiency of the automatic stoker may be greatly improved. For many purposes a rate of 25 lbs. of coal per sq. ft. of grate area is the best rate of combustion with an automatic stoker, but occasionally much higher rates are desirable, according to the coal and the boiler. H. G. SCHURECHT

104. Deposits brick in neat pile on job. ANON. *Brick and Clay Record*, **60**, 538–540 (1922).—A new brick truck with improvements for loading and unloading is described. H. G. SCHURECHT

105. Burning in a coal fired Dutch kiln. ELIAS PETTS. *Brick and Clay Record*, **60**, 533–534(1922).—In firing up draft kilns of the Dutch type P. recommends keeping fires low in beginning, keeping grates well covered and fire should be kept level. Heavy firing causes trouble and fires should be cleaned often. H. G. SCHURECHT

106. Heat conservation studies on kilns. DR. E. REUTLINGER. *Trans. Ger. Ceram. Soc.*, **2**, 33(1921).—Describing the activities of the Society of Heat Conservation Engineers with headquarters in Cologne in providing more scientific control of the burning processes in the ceramic industry. The general procedure is: 1. The study of present methods and expert suggestions for improvements. 2. Introduction of improvements and education of management and personnel to obtain best results. 3. Introduction of practical heat control methods coupled with periodic inspection. 4. Coöperation in research work covering fundamental improvements in the ceramic industry. Observations so far show the following general fundamental weaknesses: A. Burning period too long. B. Coal consumption too high. C. Quality of ware irregular. In the past too much dependence placed on the intelligence and watchfulness of the burners. F. A. W.

107. Absorption of hollow tile. ANON. *Technical News Bulletin of U. S. Bureau of Standards*, **60**, 12.—An investigation has been conducted by the Bureau of Standards to determine the difference in results obtained with various methods and their effectiveness in determining the total porosity. Specimens of the different types of clay were successively immersed in water for periods up to 9 days and in boiling water for periods up to 5 hours with detern. of rates of absorption. Similar deterns. were made under vacuum and finally the total porosity was obtained by volume and sp. gr. measurements. The results, while varying considerably between different types of clay, are in general: (1) Absorption detd. by cold water immersion does not approach near enough to complete saturation to give practical and consistent results; (2) the best practical method consists in boiling for 5 hours, cooling the water and specimens to room temperature, and allowing them to soak for 1 hour. When about 88% saturation is reached, the absorption thus deterd. is on the average 1.28 times that deterd. by immersion in cold water for 72 hours. (3) Proper treatment under vacuum will give nearly the full saturation and porosity, but the method is probably too complicated for use in acceptance tests. H. F. S.

108. Rational analysis as a plant control. DR. R. RIEKE. *Ber. der Deut. Keram. Gesellschaft.*, **3**, Pt. 1, 24(1922).—The writer reviews several methods of detg. kaolin in clay and advocates the Kallauner-Matejka procedure which permits the detern. of kaolin content in clay with good accuracy in 6–7 hrs. time. R. F. G.

109. Connection between viscosity and chemical constitution of gases. HARRY SCHMIDT. *Z. Elektrochem.*, **28,** 50–5(1922).—A mathematical paper. Proof is put forward that the mean cross-section of the mol. sphere of action in gaseous compds. (which dets. the magnitude of the coeff. of viscosity) conforms to those regularities which are derived geometrically from chem. constitution for the mean cross-section of the mol. itself. H. JERMAIN CREIGHTON (*C. A.*)

110. The manufacture of ceramite. A. E. BUCH. *Kalk, Gips u. Schamotte Ztg.*, **28,** No. 13 (July 7, 1921); *Chimie et industrie*, **7,** 101(1922).—Ceramite is an artificial product, prepd. from powdered clay and quartz sand. The mixt. is fired at cone No. 18. A stone of Hungarian origin showed: SiO_2 54, Al_2O_3 14, Fe_2O_3 8, CaO 16, and MgO 4–5. A. P.-C. (*C. A.*)

PATENTS

111. Means for making building blocks. HARRY E. CLOUSER and EDGAR R. THORNTON. U. S. 1,410,166, March 21, 1922. An app. for making building blocks comprising a support, a mold container fixed thereto, mold-pieces removably fitted in the container, the container being open ended, and arranged to receive the block material from above, means for pressing the material into the vol. included by the mold-pieces, and means for then freeing the mold from the block by a movement of the former in a horizontal plane. C. M. S., JR.

112. Processes for the manufacture of briquettes. E. POLLACSEK. E. P. 157,908, October, 1921. Briquettes are prepared by compressing in the cold state a mixture of coal dust, or rubbish or waste metals, and a binder prepared from alkaline sulphite-cellulose waste lye and mineral oil as described in E. P. 157,907.
H. Hg. (*Jour. Chem. Ind.*)

113. Apparatus for the manufacture of hollow bricks closed on all sides. AUGUST KAHR. Germany 1,411,170, March 28, 1922. In a continuous hollow brick or tile making machine, the combination with a mouth-piece through which clay is expressed: of a cylindrical rotatable core having a clay forwarding recess in its periphery and having means to conduct air to the interior of the clay string during the rotation of the core.
C. M. S., JR.

114. Twin wall brick. THOMAS W. PEIRCE. U. S. 1,410,953, March 28, 1922. A reversible channel brick of the kind described, of a width to extend from face to face of a wall, comprising two wall portions each cored longitudinally and united intermediate their height by a central web defining, with the inner faces of the wall portions, a plurality of centrally located air channels. C. M. S., JR.

115. Glass. E. C. SULLIVAN AND W. C. TAYLOR. U. S. 1,408,145, Feb. 28, 1922. A glass adapted for *making elec. lamp bulbs* is formed from SiO_2 71.9–74.5, Na_2O 20.2–21.1, Al_2O_3 0–2, CaO 2.45–2.77 and MgO 1.95–2.6%. Cf. *Ceram. Abs.*, **1,** 82(1922). (*C. A.*)

Glass

116. The stability relationships of the oxides of silicon and fused silica. RUDOLF WIETZEL. *Z. Anorg. Chem.*, **116,** 71(1921).—A 24 page article which is summed up by the author as follows: The following data were detd. exp. (1) The heat of cryst. at room temp. of cristobalite, quartz and chalcedony, measured as the difference of the heats of soln. in HF of the fused silica and the crystd. form. (2) The mean sp. hts. up to the m.p. (3) The m.p. of cristobalite as 1696°. The m.p. of quartz was *estimated* at 1600–1670°. In the case of cristobalite and quartz variations in the inversion point and in the heat of inversion were established. These were explained as due to grains of different size. It appeared that chalcedony exhibited no *unusual* SiO_2 modification

but was quartz of microcrystallin structure. The following systems were investigated in the light of Nernst's ht. theorem.

Fused Silica – Cristobalite
Fused Silica – Quartz
Cristobalite – Quartz

The calcd. A-U diag. for cristobalite-quartz is in complete harmony with the observations. Also the facts that fine grained and twinned substances possess a lower inversion point are consequent of the theory. In the systems with a "glass" phase the establishment of a diag. is attended with difficulties, which is explained by the fact that fused silica and apparently all amorphous-glassy subst. even at the lowest experimental temp. depart considerably from the Deby's T^3 low. The theory therefore indicates the reverse of the conjecture that the sp. ht. decreases to the zero point.

E. Ward Tillotson

117. The annealing of glass. Taffin. *Compt. rend.*, **174,** 36–9(1922).—Adams and Williamson (*Ceram. Abs.*, **1,** 166(1922)) obtained a law for the release of stress in glass. T. from a number of expts. concludes that while this law represents the results accurately enough over certain limits of stress, a more complicated equation is needed for a more extended range. Two forms for such equations are suggested.

E. D. W. (*C. A.*)

PATENTS

118. Glass-working mechanism. Noble W. Hartman. U. S. 1,408,000, Feb. 28, 1922. A glass-blowing machine comprising a stationary frame, a non-traveling mold mounted thereon, a blow-pipe, means for rotating the blow-pipe about its longitudinal axis and for swinging it from the mold into a glass pot to gather a charge of glass and then back to the mold, means for marvering the charge during its return to the mold, means for admitting air to the blow-pipe while in operative position with respect to the mold and means for removing the blown article from the blow-pipe during its movement toward the glass pot, the aforesaid means comprising means for causing the aforestated operns. to be automatic and to follow a predetermined sequence, and a single means for supporting the blow-pipe and maintaining it in substantially the same vertical plane during all of the opern. C. M. S., Jr.

119. Glass. Eugene C. Sullivan and William Chittenden Taylor. U. S. 1,408,145, Feb. 28, 1922. Cf. *Ceram. Abs.*, **1,** 82(1922). A glass contg. over 70% silica, over 20% soda and oxides of bivalent elements of the second group of the periodic system, the mol. percentage of the oxides of bivalent elements totaling 7 and less than 12 and also contg. over 1% of alumina. C. M. S., Jr.

120. Initial-puff mechanism for glass-blowing machines. Jacob Weisenberger. U. S. 1,410,857, March 28, 1922. In a device of this kind, the combination of a blow-pipe frame, a cam movable in respect to the frame, a fixed cam plate, a spring actuated air pump for injecting an air puff into a gather of glass carried on the end of a blow-pipe in the frame, means actuated by the movement of the frame for cocking the pump, a trigger mechanism for releasing the pump, a rock-shaft mounted on the cam plate and having a laterally extending arm in engagement with the trigger releasing mechanism, and means for actuating the rock-shaft by the movement of the cam in respect to the blow-pipe frame. C. M. S., Jr.

121. Glass. William Chittenden Taylor. U. S. 1,411,133, March 28, 1922. A glass opaque to the visible light in plates 6 mm. in thickness, and containing manganese dioxide and chromium sesqui-oxide. C. M. S., Jr.

122. Glass. William Chittenden Taylor. U. S. 1,411,134, March 28, 1922. The process of intensifying the color action due to manganese-dioxide by adding to the glass an oxygen compd. of chromium. C. M. S., Jr.

123. Glass-treating fabric and emulsion. ALBERT L. CLAPP. U. S. 1,411,409, April 4, 1922. A wiper for glass comprising a sheet of fibrous material impregnated with an emulsion of kerosene, glycerine and soap. C. M. S., JR.

124. Glass cutter. JOHN R. SCOHY. U. S. 1,411,524, April 4, 1922. In a glass cutter for severing glass cylinders a frame, the edges of the frame having a curvature substantially the same as that of the glass cylinder to be cut, a glass cutter pivotally mounted on the frame and having cutting point, means for producing a substantially constant pressure of the glass cutting point, and means for maintaining a constant direction of pressure relative to the portion of the surface of the glass cylinder against which the point is pressed. C. M. S., JR.

125. Metallizing pottery and glass. Q. MARINO. Brit. 172,723, Sept. 11, 1920. The glaze is removed or the surface roughened by chem. or mechanical means, a silver coating is formed by a chem. process and finally plated with a metal or alloy by electrolysis. The silvering process consists in applying a soln. of $AgNO_3$ in alc., or alc. and ether, allowing the solvent to evap., applying a soln. of formic acid or of formate of Na, K, or NH_4, brushing the surface with a fine wire brush, dipping the article in warm soln. (*C. A.*)

126. Glass manufacture; crucibles, etc. NAAMLOOZE VENNOOTSCHAP. PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 172,610, Nov. 9, 1921. App. for handling or working molten glass is made of a metal or alloy having a high m. p., not evolving gas when heated and forming an adherent and insol. coating of oxide which protects it from attack by the molten glass. Alloys of Cr or Al with Fe, Co, and Ni are mentioned. An alloy of 60% Fe with 40% Cr in particular is suggested. (*C. A.*)

Cement, Lime and Plaster

127. The variation with the temperature of the thermal conductivity of cast iron. E. E. HALL. *Phys. Rev.*, **19**, 237–40(1922).—Results on Fe contg. 3.5% C 2.2% Si and 0.64% Mn indicate that the cond. at 542° is between 2 and 3 times its value at 195°. E. J. C. (*C. A.*)

128. Homogeneity and the raw materials of cements. JULES DAUTREBANDE. *Rev. Mat. Constr. Trav. Pub.*, **149**, 25–27(1922).—Foreign materials are added to cements (a) At the time of grinding the cement: (1) *Materials having a chem. action on the cement.* Such substances as $CaSO_4$ and $CaCl_2$ are added with the object of regulating the setting of the cement. These materials form sulfo-aluminates and chloro-aluminates of lime respectively. (2) *Materials having only a physical action on cement.* These are inert materials as blast fur. slags put in to modify the qualities of the cement. The result is to slow up the setting, to diminish somewhat the tensile strength and to diminish the sp. gr. of the cement. (b) At the time of mixing the cement for use. (1) Sodium carbonate accelerates the setting. (2) Materials to make the mortar of the cement impermeable—such as finely divided calcined clay or slaked lime. Methods for detecting foreign materials in cements. (1) *Boiling water test.* The presence of slag is shown by the blue-green color developed on a test piece when held in boiling water, due to iron sulphide in the slag. Sulfur in cement is usually there as the sulfate, which does not give a coloration. (2) *Microscopic examn.* Slag particles may easily be distinguished by their blue tinge. (3) *Flotation in methylene iodide mixture.* A mixture of benzene and methylene iodide having a density of 2.93 is prepared—the cement having a density of about 3.1 settles, while foreign subs. as sand, siliceous materials, limestones, chalk and slag will float. (4) *Chemical analysis.* A sample of cement is screened by a 200 mesh screen, and the finer material is further separated by elutriation. The chem. analyses of the finest and coarsest divisions will show greater differences in compn. than would result from screenings of a sample of pure cement. LOUIS NAVIAS

129. Lighting up a modern vertical cement kiln. C. TSOUNTAS. *Rev. Mat. Constr. Trav. Pub.*, **151**, 70–1(1922).—After an inspection of the mech. parts, to make sure that they are functioning properly, a new kiln is filled in with wood on the grate 1 m. high, and then burned so as to dry out the masonry thoroughly. Large clinkers (about 12–13 cms. in diam.) or waste brick are then fed in thru the mouth of the kiln on to the grate, by means of a wicker basket suspended by its handles by two ropes. Much damage can be done to the refractory lining, if clinkers are just dropped in. The kiln is filled up to within 3 m. below the mouth of the kiln. The clinkers are then levelled off and green brick are lined up in layers against the refractory lining on their narrow and longer sides, one deep. On the clinkers, straw and oiled cotton-waste to a depth of about 50 cms. are filled, then kindling wood for a depth of about 70 cms. Four wooden conduits, 20 cms. × 20 cms. × 3 meters long, are then stuck into the kindling wood in a vertical position. Around the conduits a layer of coke is put, making it thicker at the periphery than at the center. On the coke, a section of green brick is laid in criss-cross manner, so as to leave plenty of air space for combustion. Alternate sections of coke and green brick are laid down until the kiln is full, not forgetting the continuous green brick lining that is being simultaneously set up against the kiln lining proper. The wts. of successive beds of coke decrease, (240–220–200 to 100 kgs.), as the number of brick in a section increase (80–100–120 to 200). Kerosene is then poured down the conduits, and each one fired at the bottom with a lighted fagot. The tops of the conduits are then covered with brick, and the fuel allowed to burn slowly. As the wood burns the material packs and the kiln is continuously kept full by supplying the green brick lining and filler. In the course of 18–20 hrs. the flame will have mounted to the mouth whereupon the grate is gotten ready to draw the kiln, which is then ready for regular service. LOUIS NAVIAS

130. Aging of ground clinker. LE GUEN. *Rev. Mat. Constr. Trav. Pub.*, **151**, 76(1922).—Clinker sept. from lime by bolting, is ground in ball mills to 60 mesh, then stored for aging. The grinding cuts down the aging period to about $^1/_5$ the time usually necessary for the unground clinker. A more homogeneous product is also insured. LOUIS NAVIAS

131. Hydraulic lime plant at Montebourg, (Manche) France. ANON. *Rev. Mat. Constr. Trav. Pub.*, **150**, 55–57(1922).—General description of plant and product, with schematic plan of operns. LOUIS NAVIAS

132. Artificial Portland cement plant at Montebourg (Manche), France. ANON. *Rev. Mat. Constr. Trav. Pub.*, **148**, 4–5, **149**, 27–30, **150**, 51–55(1922).—Description of the lime and clay quarries, prepn. of materials, grinding, burning, storing, labs., properties and uses of their cement, together with plans and photographs of the plant. LOUIS NAVIAS

133. The theory and practice of stone-wood (magnesia cement or "composition") floorings. A. STETTBACHER. *Schweiz. Chem. Ztg.*, **1921**, 113–7.—The use of this material is increasing but there are occasional failures through improper technic in prepn. or application or exposure. For the properties of magnesia cements see "Magnesia Cement Plastics" *Schweiz Chem. Ztg.*, **1919**, 198–201 and "Composition Flooring" by H. M. Hooker, *Eng. Soc. Western Penn.*, **29**, 305–338, 418–44(1913).—MgO, $MgCl_2$ consists of MgO 0.423, and $MgCl_2$ 1 pt. In practice, however, the standard formula of the associated German mfrs. is 2.40–2.70 pts. of MgO by wt. for 1 pt. $MgCl_2$. Fillers are also used. If the MgO is less than 2.40 the hygroscopic properties of $MgCl_2$ interfere. Ordinary compn. flooring contains (excluding mineral and color addns.) 6 pts. by wt. of burnt magnesite, 5 of cryst. $MgCl_2$ (2.30 anhydr.), and 2 of wood meal. A table is given of corrections if magnesite of less than 100% is used. $MgCl_2$ solns. with sp. gr. from 1.152 to 1.242, contg. 42 to 64% of cryst. $MgCl_2$ are used. A table shows sp.

gr. and anhyd. $MgCl_2$ content. $MgCl_2 \cdot 6H_2O$ contains 46.9% $MgCl_2$. Enough $MgCl_2$ soln. is used to make a stiff paste. Arbitrary grades, *e. g.*, 15 and 18 are used for solns. of 1.152 and 1.184, resp. The corresponding vol. in l. per 5 kg. of cryst. $MgCl_2$ is stated. Analyses of compn. flooring always show some free $MgCl_2$ but a little does no harm. Two analyses show: moisture 4.46–4.01%, wood meal (ash and water-free) 11.50–15.52%, silicates 4.68–4.80%, Fe_2O_3 and Al_2O_3 2.02–2.41%, $CaSO_4$ 1.95–1.66%, $MgCO_3$ 13.02–11.84%, MgO (present as hydroxide and oxychloride) 20.40–17.35%, $MgCl_2$ (H_2O-free) 10.21–10.88% (combined 7.18–7.29%), combined water and org. matter 20.17–19.98%. The ratios of $MgCl_2$ (total) to MgO in all forms in these two cases are 1:3 and 1:25 as compared with the standard ratios of 1:2.4 to 2.7. Some of the MgO changes to useless $MgCO_3$ on standing and some of the $MgCl_2$ remains uncombined. It is doubtful whether the method of detg. this is accurate. It is evident that close techical supervision of compn. flooring is vital. Grecian magnesite is used.

JAS. O. HANDY (*C. A.*)

134. Iron blast furnace slags and their use as building material. RICHARD GRÜN. *Z. angew. Chem.*, **34**, Aufsatzteil, 101–2(1921).—These slags consist of CaO, SiO_2 and Al_2O_3 with small amts. of MnO, MgO and FeO. If unusually high in CaO they are less viscous. The usual uses for granulated and lump slag are mentioned and coal mine filling is suggested. Slag sand mixed with $Ca(OH_2)$ makes a good mortar. Slag with soda and sand adns. should make good glass. Cement manuf. is the rational use for slag. Its normal av. compn. requires only slight modification by CaO addn. This cannot be readily done because of the large heat requirement. G. has used with success an elec. furnace for making CaO addns. Passow has proved that for cement making, slags must have the phys. structure produced by rapid cooling. Otherwise they will not set even if of correct chem. compn. It is necessary also to have as accelerator for the finely ground slag a quantity of portland cement clinker equal to at least $^1/_6$ of the slag. Iron portland cement contains approx. 2 parts portland cement to 1 part slag. Slag lime bricks are made as sand lime bricks are made. They are best hardened by exposure to the exhaust from gas-engines. A porous brick is made by pressing and steaming a mixt. of lime and fine slag with granulated slag.

J. O. H. (*C. A.*)

135. Report on heat insulators. ANON. H. M. Stationery Office, Kingsway, London, W. C., *Special Rept.*, No. 5(1922); *Analyst*, **47**, 119–22.—An abstract. Special app. was devised for the measurement of thermal cond. in abs. measure. Data obtained indicate practically the same thermal cond. for cork, slag wool, charcoal and wood fibers, when of good quality and dry (0.00011 g. cal. per sec. per cm. per l.). Different brands of cork, etc., of good quality show but little differences in their efficiencies as insulators. Tests indicate that a considerable decrease in the insulating efficiency may take place in use. Heat transmission is complicated in the case of coarse granular materials by the circulation of convection currents. Rubber expanded by gas into a highly cellular state has a cond. of 0.000085 which is lower than that of cork and only $1^1/_2$ times that of still air. The original describes the method and app. used for detg. the sp. heats of the materials.

W. H. BOYNTON (*C. A.*)

136. Crystallization and transposition phenomena in the hardening of cement. DR. SCHOTT. *Zement*, **10**, 294–5, 306–8, 328–32(1921); *Chimie & industrie*, **7**, 322; cf. *Ceram. Abs.*, **1**, 91(1922).—On examg. the fracture of cement, crystals are apparent with a magnifying glass, or even with the naked eye when the light strikes properly; but they are too small to be sepd. and analyzed. S. used the following method for obtaining larger crystals: Pour a cement mortar of ordinary consistency on a glass plate covered with a moist sheet of blotting paper and press with a similar glass plate placed on top of the cement. When the cement has set, remove the glass plates and blotting paper, cut in-

to disks, perforate and lay on a wire screen free from rust and provided with a wooden rim, place in a cylindrical glass jar of such dimensions that a space of 1–2 mm. is left between the edge of the disks and the glass, fill the jar with water, and stopper. After a considerable length of time the disks coalesce. First of all colloidal matter, consisting of Ca $(OH)_2$, seps. from the mass, followed after some time by an intense production of very thin foliated crystals of each disk. In 6 yrs. crystals of 0.5 cm. face were obtained. They were hexagonal, negative, and uniaxial; their chem. compn. was H_2O 21.95, SiO_2 2.10, Al_2O_3 0.85, CaO 75.45%, corresponding to $CaO.H_2O$ (CaO 75.67, H_2O 24.33). This confirms the hypothesis that the setting of cement is due to the crystn. of $Ca(OH)_2$. The limit of the CaO content is that which makes the cement expand. S. then investigated the effect of burning, of clinkering temp., and of the various materials contained in the cement. A. P.-C. (*C. A.*)

137. Advantages of hydrated lime in paving concrete. T. B. Shertzer. *Can. Eng.*, **42**, 111–112(1922).—The advantages claimed are the prevention of segregation and consequent increase in uniformity; lubrication of the concrete which makes placing and finishing easier; formation of an insol. water-tight skin on the surface; promotion of a more compact arrangement of the other ingredients and efficiency as a water-tightener. J. C. Witt (*C. A.*)

PATENTS

138. Cementing or luting composition. K. O. Dufva. U. S. 1,407,194, Feb. 21, 1922. A cementing compn. adapted for use on steam pipe joints is formed of powdered corundum and paint, rosin and shellac varnish. (*C. A.*)

139. Separating composition for plaster casts. J. B. Jones. U. S. 1,406,651, Feb. 14, 1922. Shellac dissolved in an aq. soln. of borax. (*C. A.*)

140. Plastic composition and process of making the same. George M. Formby. U. S. 1,409,939, March 21, 1922. The herein described new article of manuf. containing a calcium oxychloride that has been heated with lime in the presence of water, and the compd. thus produced mixed with plaster of Paris. C. M. S., Jr.

141. Plastic cement mixture. W. E. W. Richards. U. S. 1,408,401, Feb. 28, 1922. A mixt. of powd. clay, ground cement and fiber with H_2O is molded under pressure to form *elec. insulators or other articles.* (*C. A.*)

142. Dental cement. S. Schiff. (*Jour. Amer. Ceram. Soc.*, **4**, 1013(1921)). U. S. 1,408,960, Mar. 7, 1922. An emulsoid acetogel of silicic acid is added to amixt. formed of pulverulent Al K silicate and H_3PO_4. (*C. A.*)

CERAMIC ABSTRACTS

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[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts* by coöperative agreement.

General and Miscellaneous

1. Canadian ceramic specialists for Canada. EDITORIAL. *Can. Min. Jour.*, **43,** 282(1922).—A movement has originated with the Canadian Clay Products Association and was discussed at the Toronto meeting in May, dealing with the establishment, at Toronto University, of a course in ceram. which would give to Canada ceram. engineers who had received both tech. training and practical experience at home. The ceram. industry is at present in an embryonic state but the raw materials for this industry, feldspar, silica rock, and china clay are plentiful, and steady progress is being made. This movement is a step in the right direction towards establishing an important new industry. O. P. R. O.

2. Bentonite. KEELE. Mines Branch, Canada Department of Mines. *Summary Report,* **160** (1918).—The variety of clay known as "bentonite" occurs in many localities in Wyoming but was first discovered in Canada in 1911 by Keele in an excavation in the town of Camrose, Alberta. Later discoveries of the clay have been made in the Edmonton formation of the Red Deer river and in the Nicola Valley, B. C. Description: When freshly exposed it varies from a light yellow to a light olive green with a waxy lustre. It is exceedingly fine-grained and has a scaly feeling when wet. It has unusual absorbent qualities being capable of taking up three times its weight in water, when it swells and becomes a jelly-like mass. Although refractory, it contains too high a percentage of fluxing impurities to be a fire clay. It cracks badly in drying. Chemical analyses of Camrose, Alberta, bentonite compared with that of Crook County, Wyoming:

	Crook County, Wyoming	Camrose, Alberta
Silica	61.08	69.14
Alumina	17.12	14.50
Iron	3.17	2.56
Lime	2.69	2.45
Magnesia	1.82	1.14
Potash	....	.19
Soda	.20	1.25
Sulphur trioxide	.80	1.70
Loss on ignition	12.10	7.71

Uses: Its chief use has been to give body and weight in the manufacture of paper. I has also been used as an adulterant of cheap candy and in the manufacture of antiphlogistine. Recently its use has been suggested as a sizing for yarns on account of the large proportion of colloidal silicate of alumina which it contains.... Further Investigation: Consequent upon inquiries directed to the Department of Mines by the Imperial Mineral Resources Bureau regarding possible sources of bentonite in Canada the localities mentioned above were again visited and work is now being done in the Mines Branch laboratory which will enable definite conclusions to be drawn regarding the suitability of Canadian bentonites for industrial purposes. O. P. R. O.

3. Clay and clay products industry of Canada. ANON. *Agric. and Indus. Progress in Canada* (C. P. R.), **3,** 2155(1921).—The clay industry in Canada is apparently on a healthy basis as the total value of products are as follows: 1920—$10,523,271; 1919—$7,906,366. In 1920 this was made up of common brick $4,868,958; pressed brick $1,756,760; fire-proofing $591,216; hollow building blocks $284,163; kaolin $15,022; terra cotta $120,875; pottery $207,410; sewer pipe $1,549,090; drain tile $619,442; other products $517,335. Canada's imports in 1920 were as follows: china clay $242,441; fire clay $276,139; pipe clay $2,442; other clays $151,760. Her total

imports of clay products in 1920 amounted to $10,781,592, principally from Great Britain and the U. S. Her total exports amounted to $323,989, of which $4,678 went to the United Kingdom, $240,128 to the U. S., and the balance to other countries. The principal centres of the clay mfg. industry are at St. John, New Brunswick; St. Johns, Quebec; and Medicine Hat, Alberta. O. P. R. O.

4. Building materials industry in Czechoslovakia. ANON. *Jour. Royal Soc. Arts* (London), **70,** 489–9(1922).—The building materials industry in Czechoslovakia occupies a very prominent position. This importance is due to the rich deposits of kaolin, clay and limestone. The brick industry is one of the oldest in the country; the number of workmen employed is 80,000; annual output 2,000,000,000 bricks and 200,000,000 tiles. Czechoslovakia contains 30 large and several hundred smaller kaolin mines and the output amts. annually to more than 20,000 wagons, of which 80% is exported. Porcelain is produced in 70 factories; the annual output exceeds 3,000 wagons, 70% of which is exported. The output of the magnesite mines is nearly all exported. 40,000 wagons of fire-proof bricks are exported. The pottery annual output amts. to 2,000 wagons, largely for export trade. There are 60 factories producing an annual total of 5,500 wagons of stone and chem. piping, largely for export trade. Flagstone industry is carried on in 12 factories, annual capacity 9,000 wagons: Portland cement, 12 factories, annual capacity 50,000, largely exported. Limestone, annual production 90,000 wagons, 10% exported. Among the natural building-stones there are numerous types of granite. Sandstone rocks are found and red, grey, and white marble are in abundance, annual export about 1,800 wagons. Building materials industry forms a group of the Federation Industrialists. There are special schools for pottery, brickmaking and stone-cutting, respectively, and the problems affecting these industries are studied from a scientific and a practical standpoint. O. P. R. O.

5. Experimental cottages. Farm colony at Amesbury. ANON. *Jour. Royal Soc. of Arts,* **70,** 508(1922).—Thirty-three experimental cottages, to test various methods of building with local materials, have been erected by the Ministry of Agriculture with the coöperation of the Dept. of Scientific and Industrial Research, London. Without expressing an opinion of the success or failure of the experimental features, the Department considers a description of the work may be of general interest and a report is now published which may be obtained from H. M. Stationery Office, London. The external walls of the several cottages are of brick, concrete, chalk and cement, rammed chalk, and straw and chalk pisé, respectively. Various experimental designs of floors, roofs, stairs, fittings and heating appliances have been used. O. P. R. O.

6. A Russian Fire Clay Concern. ANON. *Raw Materials Rev.,* **1,** 58(1922).—The Borovitch fire clay establishment is able to make a good rept. on its production of fire clay and other goods, which has improved monthly since last autumn, reaching its highest point in March, 1922, when its presses turned out 1,250,000 bricks against a million in January and February. The work per man per day has also improved, and is even better than pre-war. But for want of fuel the quantity fired has had to be reduced, so that some presses recently started will have to be stopped. The number of workers and other hands engaged at the factory is 1,433. O. P. R. O.

7. Some properties of commercial silicate of soda. JAMES G. VAIL. *Amer. Chem. Soc.,* (Sept. 2–6, 1919).—A discussion of the properties of commercial silicate of soda and its phys. characteristics. A definite compd. of the formula Na_2SiO_3 is easily prepd. in cryst. form from solns. containing sodium hydroxide and commercial sodium silicate. It crysts. with 9 mols. of water. It melts in its water of crystn. at about 40° C. It is rapidly decomposed by the carbon dioxide of the air. This product has no commercial significance. All the forms of sodium silicate in commercial use contain more silica than is indicated by the formula Na_2SiO_3, one grade having about 4 times

this amount. The ratio between sodium oxide, Na_2O, and silica, SiO_2, may be varied between 1 to 4 and 2 to 3. Products more alk. than the latter ratio are not made, on account of their tendency to form cryst. masses. The solns. of these different silicates vary largely in their characteristics. To take the two extremes; that with a ratio of 1 to 4, as above, may be concd. to about 37° Bé, which corresponds to about 34% total solids. In contrast to this type, a silicate with a ratio of 2 to 3 is thinly fluid at 37° Bé, and may be concd. to approx. 69° Bé, or about 62.5% total solids. Between these two extremes any intermediate grade can be produced; thus a considerable range of characteristics which are of importance in the adhesive uses of silicate of soda can be secured. As the propn. of alkali increases, the possible concn. increases, and there are in regular use different silicate solns. of 37°, 40°, 42°, 47°, 50°, 52°, 60° and 69°, each adapted especially for some commercial use. The colloidal nature of silicate solns. is indicated by b. p. but little higher than the b. p. of water. This is true even in the case of the 69° soln. which contains more than 62% of solids. The f. p. also are but slightly depressed from that of water. The ordinary 40 silicate freezes at about —3° C. When such a soln. is slightly warmed, the crys. tend to float. Solns. of above 60° Bé in concn. do not lose their transparency on freezing, but become progressively harder and finally brittle. Silicate of soda is pptd. by most salts of the heavy metals, and the ppts. are believed to contain free silicic acid along with metallic silicates. Pptn. is also effected by various liquids which tend to dehydrate the silicate soln. For instance, alc., glycerin, salt brine, and strong ammonia solns. will ppt. concd. solns. of sodium silicate. Such ppts. may be redissolved, but the second soln. has somewhat different characteristics from the original silicate soln. notably in respect to viscosity. The viscosities of solns. of silicate of soda are of interest in connection with many of its uses. The forms rich in silica rise slowly in viscosity until the condition of jelly is approached, when they rise very sharply. This is true whether the rise in viscosity is due to decrease of alkalinity, decrease of temp., or increase in concn. To prep. a silicate adapted as a quicksetting adhesive, use is made of this fact. A change from a liquid to a solid condition may occur with the loss of as little as 10% of moisture, this amt. being very quickly absorbed into a layer of paper board when the silicate is thinly spread on its surface. If suddenly exposed to a temp. above the b. p. of water, such a soln. will expand into a mass of permanent bubbles of beautiful white appearance and apparent sp. gr. as low as 0.01. Such a product is an excellent thermal insulator. Silicate of soda is the most convenient source of gels of silicic acid which may be prepd. with either alkaline or acid reaction by neutralizing more or less completely. Any mineral acid can be used for this purpose, and by varying concns. of acid and of silicate soln., gels of a wide variety of physical characteristics can be secured. Strongly acid gels have been used to prevent the splashing of acid from storage batteries. Very hard neutral gels have been used for prepg. material suitable for the adsorption of gases. The tensile strength of silicate of soda mixts. used for acid-proof cements is easily brought up to 1700 lbs. per sq. in. for air-dried briquettes, while the bond produced by baking silicate of soda and clay, as is the practice in the manuf. of abrasive wheels, easily yields a strength above 2000 lbs. per sq. in. F. H. R.

8. Producer gas plant design. R. F. Clewell. *Glass Industry*, **2**, 283–7(1921); **3**, 5–9, 32–6(1922), 11 figs.—Plant design for the manuf. and distribution of raw producer gas is discussed in detail under the following heads: Plant location, plant capacity, selection of equipment, provision for future extension, arrangement and accessibility of equipment for ease of operation and maintenance, and the gas-distributing system. J. B. Patch (*C. A.*)

9. The importance of clean gas for the producer plant. F. J. Denk. *Glass Worker*, **41**, No. 27, 12, 36–8(1922).—The savings resulting from the use of small gas pipe in-

stead of large brick-lined mains together with repairs and cleaning, etc., of lines and regenerators pay for the cost of producing clean gas which is also more efficiently used in the furnace. J. B. PATCH (*C. A.*)

10. Graphical treatment of stack gas analysis and of producer gas analysis. W. TRINKS. *Blast Furnace Steel Plant*, **10**, 131–5(1922).—A review of charts introduced by W. Ostwald and developed by Claus and Neussel. (Cf. *Ceram. Abs.*, **1**, 154(1922). C. E. CARLSON (*C. A.*)

11. Electrical precipitation. H. J. BUSH. *J. Soc. Chem. Ind.*, **41**, 21T–28T(1922); cf. *C. A.*, **15**, 2587.—An interesting review with bibliography and drawings of installations. Elec. pptn. is now in use all over the world. It has been applied to the pptn. of H_2SO_4, precious metal dust, potash, particles from blast furnaces and pyrite burners, lead smelter fumes, tin furnace fumes, alumina, calcining furnace gases, waste gases from evaporators of sulfate liquors from cellulose works, gases from coal briquetting furnaces, copper converters, McDougall roasters and to the purification of and removal of bacteria from air. D. MACRAE (*C. A.*)

12. Modern tunnel-kilns. A. E. BUCH. *Kalk Gips- u. Schamotte Ztg.*, **28** (June 21, 1921); *Chimie et industrie*, **7**, 518(1922).—A discussion of the merits and advantages of modern tunnel kilns in the ceramic industry, together with a description of the Buch, Möller and Pfeifer, and Dressler systems. A. P.-C. (*C. A.*)

PATENTS

13. Zinc oxide. F. C. W. TIMM. U. S. 1,409,318, Mar. 14. Zn-bearing slags or the like are placed on a layer of dezincing material such as C, lime and Fe compds. and hot combustion gases are passed through the charge and gases laden with ZnO are withdrawn from below. (*C. A.*)

14. Phonograph needles of shale or clay. M. T. STRAIGHT. U. S. 1,409,498, Mar. 14. Needles of shale or clay are heated to near the m. p. and then gradually cooled. (*C. A.*)

Apparatus and Instruments

15. The new radiation pyrometer of Hase. ANON. *Gieserei Ztg.*, **9**, 31–2(1922).—An illustrated description of an instrument for foundry practice. It is a compromise between scientifically precise app. like the Wanner pyrometer and the comparatively crude pyroscopes so generally used. It is a modification of the Féry pyrometer, in which the sensitivity of the radiation receiver is greatly increased. It is in the form of a telescope weighing 2.5 kg. and can be used by hand. The temp. can be read by direct observation, and the indicator is so adjusted that temp. variations in short periods can be detected. From 1 m. or greater, the reading is independent of the distance. The temp. ranges are 700–1400°, and 1200–2000°, and at 1000° an error not over 10–15° is practicable. C. C. DAVIS (*C. A.*)

16. Improvements in measuring apparatus for gases, vapors, liquids and granular substances. F. M. BAYER. *Chem. App.*, **8**, 59–61, 67–9, 88–90, 94–6, 161–3, 170–3, 179–81(1921); **9**, 22–4, 52–4(1922).—A review of Ger. patents, with 60 cuts. J. H. M. (*C. A.*)

17. Conveying machinery in the chemical industry. GEO. F. ZIMMER. *Chem. Age* (London), **6**, 230–33(1922); cf. *C. A.*, **15**, 1967.—This article covers bucket elevators and band and reciprocating conveyors. It is suggested that stainless steel and high Si irons be used for chem. plant elevators, etc. A. E. MARSHALL (*C. A.*)

18. Disappearing filament pyrometer. ANON. *Engineering*, **113**, 501(1922).—This paper describes an optical pyrometer of the disappearing filament type in which

the optical system, lamp, rheostat and meter are in one compact unit. In order to utilize the full scale of the meter the latter is connected in a special way. The lamp is placed in one arm of a Wheatstone bridge, the other three arms being manganin resistances. By this device the scale of the meter may be so calibrated as to begin with the lowest temp. which the instrument will read, thus eliminating the useless portion of the scale. The range is from 700 to 1200° with current flowing in one direction and from 1200 to 1510° when the direction is reversed. Absorption screens are used for higher temps., and the accuracy is about 5°. DONALD E. SHARP (*C. A.*)

PATENTS

19. Apparatus for drying and medicating air. C. DOBBS and A. E. PAINTER. U. S. 1,409,364, Mar. 14, 1922. (*C. A.*)

20. Detachable puddle rod and blade. L. W. JONES. Can. 217,403, Mar. 28, 1922.—A melting pot has a tubular shaft arranged for operation therein and arms or blades, which are substantially triangular in cross section and have inclined openings therethrough, carried by the lower portion of the shaft. (*C. A.*)

21. Separating solid materials. S. NETTLETON. Brit. 174,739, Nov. 2, 1920. For sep. solids, *e. g.*, sepg. stone, shale, etc., from coal, the mixt. is delivered at a suitable velocity on to one or more flat horizontal rotating disks upon which the constituents are deflected to different degrees according to their frictional coeffs. The mixt. may be delivered by inclined shoots to the disks. A suitable construction is specified. (*C. A.*)

Chemistry, Physics and Geology

22. Physical chemistry and ceramics. EDWARD W. WASHBURN. *Jr. Franklin Inst.*, **193**, 6, 749(1922).—The application of phys. chem. to the soln. of ceram. problems is discussed under the fol. heads. (1) Colloid chem., (2) heterogeneous equilibrium at high temps., (3) properties of silicate solns. at high temps. including d., elec., cond., viscosity and surface tension, (4) standard methods of testing ceram. materials. Data on the viscosity and surface tension of the system Na_2O-SiO_2-CaO is given. R. J. M.

23. Stratification of clay suspensions and its use in the determination of the size of clay particles. ERNST UNGERER. *Kolloidchem. Beihefte*, **14**, 3–5, 63–96(1921) (R. RIEKE). Suspensions of known substances such as ultramarine blue are made, different fractions obtained by centrifuging and the particles in each strata counted, weighed and measured as described in the article. By this means data of the following nature is obtained:

TABLE I

Suspension	Time of centrifuging in min.	Weight of one particle	Diameter of one particle
Ultramarine blue number 8	2 ½	$1.79 \cdot 10^{-11}$g	$2.08 \pm 0.038\mu$
"	3 ½	$1.34 \cdot 10^{-11}$g	$1.76 \pm 0.041\mu$
"	4 ½	$0.80 \cdot 10^{-11}$g	$1.23 \pm 0.004\mu$
"	4 ½+	$0.30 \cdot 10^{-11}$g	$0.86 \pm 0.009\mu$

The size of the particles was also determined by means of Stokes' Formula from which the following relation is obtained—

$$r = \sqrt{\frac{9}{2} \cdot \frac{n}{D-d.g}} \cdot \sqrt{v}$$

when

r = radius of particle
n = viscosity of fluid
D = density of fluid
d = density of particle
v = rate of fall of particle

This formula gives results which check very closely with those obtained by direct measurement as described. A clay suspension was then studied and following data obtained:

TABLE II

Time of standing	Height in cm. of				
	1 layer	2 layer	3 layer	4 layer	5 layer
96 hours	...	1.8	2.7	3.6	7.9
144 "	1.2	2.1	3.6	5.4	12.2
192 "	1.4	2.6	5.0	7.8	16.7
240 "	1.9	3.8	6.5	10.7	20.3
Size of particle (calculated)	0.151μ	0.213μ	0.278μ	0.344μ	0.497μ
Size of particle (measured after 240 hours)	...	0.200μ	0.297μ	0.332μ	0.527μ

The writer also demonstrated the adaptability of Stokes' Formula to the study of soil suspensions and of emulsions. Several conclusions covering the characteristics of the strata and the conditions under which they will form are added. R. F. G.

24. A new source of soapstone in Ontario. H. S. SPENCE. *Memorandum No. 4, Mines Branch,* Dept. of Mines, Canada (April, 1922).—An extensive deposit occurs at Wabigoon Station on the main line of C. P. R. near Dryden, Ontario, and is distant only 500 yards from the railroad. It is well situated for working but no development work has yet been conducted. Tests of the stone for crushing strength, transverse strength, corrosion, absorption, fusion temperature, as well as chemical-analyses, have been made in the Mines Branch laboratory and show the deposit to be a very high grade. In appearance and composition (as shown by analyses) it is very similar to the so-called "Alberne Stone" quarried extensively in Virginia. The use which suggests itself most strongly for the stone of this deposit is for bricks for lining the smelting furnaces of sulfate pulp mills, which require a refractory material which is structurally strong and does not crack under heat. The dozen or more of such mills in Canada would benefit greatly if the Wabigoon stone proves profitable for working, as at present all such material has to be imported. The report concludes with the words, "This deposit is the most promising from an economic standpoint of any of the soapstone occurrences seen in Canada." O. P. R. O.

25. Fire brick manufactured at Clayburn, British Columbia. WILLIAM FLEET ROBERTSON. British Columbia. *Annual report of the Minister of Mines,* **N 28** (1921).

—A bed of excellent fire clay, occurring in bedded rocks of the Eocene age, is found in commercial quantities near Clayburn. Shales, sandstone, and conglomerates, all but little consolidated, make up this sedimentary series. Fire brick is the principal manufactured article produced by the Clayburn Co. Ltd., but in addition common brick, paving brick, tile, drain-pipe and prepared fire clay are made. Associated with these rocks is a bed of lignite which is sufficiently good to be used for firing the boilers of the fire-brick plant. O. P. R. O.

26. Talc in Canada. M. E. Wilson. *Can. Min. Jour.*, **43**, 356(1922).—Deposits of talc or soapstone occur throughout Canada in Nova Scotia, British Columbia, Ontario and Quebec, but most of these, so far as development work has shown, are either limited in extent or impure, so that the only extensive known deposits of high grade talc in Canada are those occurring in Ontario. The rocks with which these deposits are associated consist almost entirely of dolomite, quartzite and interlaminated quartz and dolomite, but batholithic masses of granite occur nearby. O. P. R. O.

27. Talc in New Zealand. P. G. Morgan. *New Zealand Jour. of Sci. and Tech.*, **2**, 112(1919).—There are numerous occurrences of talc (also called soapstone, steatite, French chalk, or potstone) in N. Z. Some of these appear to be of good quality. At the present time colored French chalk for tailors' use is being sold in N. Z. at something like 10s. per pound, and the manufacture of crayons, etc., from local talc appears to be a feasible undertaking for any person acquainted with the technical details. Crystalized talc of great purity is found in small pockets here and there in association with the talc and serpentine rocks of north Westland; green talc schists are also common; but owing to the difficulty of access none of these talcose rocks have economic value at the present time. O. P. R. O.

28. Clay and fullers' earth in New Zealand. P. G. Morgan. *New Zealand Jour. of Sci. and Tech.*, **2**, 119(1919).—On account of an urgent demand for fullers' earth suitable for use as a clarifying medium, the Geological Survey has given further attention to the subject and largely through inquiries and investigations made by the Survey and the Dominion Laboratory, it is believed that at least three satisfactory sources of fullers' earth have been discovered—one at Glen Massey, Waikato district; another at Croydon, near Gore; and the third at Hokonui, Southland. In addn. to these many other clays have been found to possess considerable clarifying power—some exceptionally good quality for use as fire clay and some valuable for porcelain. O. P. R. O.

29. Graphite in New Zealand. P. G. Morgan. *New Zealand Jour. of Sci. and Tech.*, **2**, 207(1919).—The numerous records of graphite occurrences in New Zealand indicate a probability of workable deposits being found if search is made. Three kinds of natural graphite—namely cryst., flake, and amorphous—are mentioned in market repts. Cryst. graphite is the nearly pure material, found in pockets and lenses, which can be put on the market without any preliminary treatment. At the present time by far the largest supplies come from Ceylon. Flake graphite is the same material as cryst. graphite, but has been produced from less pure deposits by some process of concentration. Amorphous graphite is in part not true graphite at all, but altered coaly material which has lost all its hydrocarbon, though it has not undergone the mol. change required to reach the stage of graphite as known to the mineralogist. Such material has no heat-resisting power, nor is it suitable for the manufacture of lead-pencils, etc. A bibliography on graphite is given. O. P. R. O.

30. Polo halite in Italy. Anon. *Raw Materials Rev.*, **1**, 43(1922).—A mineral of great utility to the glass industry and for soap-making has been found at Calascibetta in the valley of the Morelle River at Sicily. It has been named "Polohalite." A dip has disclosed the following formation:—Saline marle containing gypsum, chloride

of sodium 2 m., sulfates of various bases 14 m., sulfate and chloride of sodium 4 m., other sulfates of various bases, marle and gypsum in great masses. It is hoped to exploit these deposits for glass works, and to a certain extent for soap making. O. P. R. O.

31. Bauxite in Italy. Anon. *Raw Materials Rev.*, **1**, 43 (1922). Large deposits of bauxite are known to exist in New Italy, particularly in Istria. It is not equal to the bauxites of Sangiunge or of the Abruzzi which are highly prized as the basis of a large national production of metallic aluminium, oxide of aluminium, and sulfate of aluminium. The Istrian bauxite does not average more than 55% of oxide of aluminium, but the deposits being near to the Austrian and German frontiers, may be exploited for export of this valued raw material to the industrial districts of Germany, which country during the war developed a most important industry in oxide of aluminium and metallic aluminium. The difference of cost of transport from Istria to South Germany as compared with that of French bauxite via Rotterdam shows the possibilities of the export of the Italian material. O. P. R. O.

32. Sicilian sulfate of soda. Anon. *Raw Materials Rev.*, **1**, 43(1922).—Several important sulfate of soda deposits have been identified in Sicily; particularly one at Bompensiere in the province of Caltanissetta, and one near Calascibetta in the same province. The deposit at Bompensiere is principally Glauberite, that is, sulfate of calcium and sulfate of sodium combined. But the constituent of the upper layers is principally pure sulfate of soda, transparent and vitreous. New methods of working have made the exploitation of these fields possible at a profit. Taking advantage of the different solubility of the salts it is proposed to dissolve them in water; the gypsum becoming residuum would crystallize the sulfate of soda. If one crystallization does not suffice, it is proposed to repeat the process until complete purification results. Instead of extracting the mineral and treating it in large shallow basins, thus obtaining the saturated solution, warm water is to be introduced into the mine, and when it is saturated with the salt, it will be pumped up as is done at Stassfurt. In this way advantage is taken of the poorer mineral. With the Glauberite there is also found some chloride of sodium. O. P. R. O.

33. World's graphite production. (1921). Anon. *Can. Min. Jour.*, **43**, 233.—Production in 1921 was less than at any time since 1902. Canada and Ceylon fell greatly behind pre-war tonnages. Dorea held its own. Germany alone forged ahead with an increase of 50 per cent more than 1920. O. P. R. O.

34. Fluorspar in British Columbia. William Fleet Robertson. *B. C. Annual Rept. of the Minister of Mines*, **No. 24**(1921).—The development work done by the Consolidated Mining and Smelting Co. of fluorspar concn. for the last two or three years has been very interesting. The Co. is now equipped with an efficient concg. mill. It produced during the year some 7,500 tons of fluorspar concentrates, carrying 87% calcium fluoride and 6% silica; and having a total value of about $175,000. The mineral is used for making hydrofluoric acid, in lead refineries in Canada and the U. S. O. P. R. O.

35. Dutch bauxite. Anon. *Raw Materials Rev.*, **1**, 58(1922).—Bauxite mines are being worked by an American company at Moengo, in the Dutch colony of Surinam. Bauxite, the ore from which aluminium is extracted, found in Surinam, Dutch East Indies, has an aluminium oxide of 55 per cent. The Bauxite Company owns twenty-two sea and river barges and seven launches, and the Aluminium Line sends its vessels to Surinam to fetch the ore to America, where it is smelted. In Surinam itself the ore is dried only; the aluminium is extracted in the furnaces in America. The quantity of ore at Moengo is estimated at 10,000,000 tons. A good harbor is to be made there in order to ensure quicker shipment of the ore. O. P. R. O.

36. Cobalt oxide in Canada. Charles W. Drury. *Ont. Bureau of Mines Rept.*,

27, Pt. 3, 31(1918).—Previous to 1903, Europe controlled the world's supply of cobalt. Since its discovery in Canada at that time, very little has been mined outside of that country. Canada produces from the cobalt ore a very high grade cobalt oxide, which is much in demand by the ceram. industries of Europe, and does this at about one-half the price that the low and medium cobalt compds. or smelts were sold in Europe ten years ago. In reviewing the metallurgy of cobalt the change is noticeable; in the European refineries ores were treated for the cobalt content alone, while from the ores of Canada, metallic silver, cobalt, nickel and arsenic oxide are recovered. The associated metals are often a source of revenue for the smelters. O. P. R. O.

37. Potash from feldspar. Sydney Johnstone. *Imperial Institute Monograph,* (1922).—This monograph deals with the sources of the world's supply of potash and among these the feldspars of Canada attract great attention, for while the problem of extracting potash from feldspar economically has not yet been solved, investigation continues and Canada's abundant supply of this source promises much for the future. A process is now on trial at the works of the National Portland Cement Co., Durham, Ont. O. P. R. O.

38. The separation of ferric iron and aluminium from calcium by the nitrate method. Charriou. *Compt. rend.,* **174,** 751–4(1922).—St. Claire Deville proposed the sepn. of Fe and Al from Ca on the basis of the fact that the nitrates of the trivalent metals are decomposed by heat, leaving an insol. oxide whereas the nitrates of alkaline earth metals are less readily decomposed and the oxides are much more sol. in water. A sepn. carried out on this basis is usually unsatisfactory because a little alkaline earth is likely to be held back in the residue of oxides. This entrainment of CaO is found to be very appreciable but is less if the nitrates are decomposed at a fairly low temp. (150°) and if the oxides are subjected to repeated treatments with boiling 5% NH_4NO_3 soln. If the residue contains this substance the entrainment of CaO is prevented but the insol. oxides are so pulverulent that they are likely to run through the filter. The most satisfactory method of working seems to be that of adding a slight excess of NH_4OH before evapg. to dryness. Then, after the ignition, treatment with NH_4NO_3 soln. serves to dissolve out all the Ca. If Al is present, however, the filtration is tedious so that it is advisable to wash the residue twice by decantation, then dissolve it in boiling HNO_3 and ppt. again with NH_4OH. It is difficult to remove all of the oxides from the dish in which the ignition took place. This difficulty may be overcome by weighing the dish at the beginning and end of the process, to find the amt. of adhering oxide, or by dissolving the residue in acid and pptg. by NH_4OH. W. T. H. (*C. A.*)

39. Specific heat of solids at high temperatures. M. Born and E. Brody. *Z. Physik,* **6,** 132–9(1921).—A mathematical paper in which are considered the quantum theory of an oscillator system of large amplitude of vibration, and the statistics of the oscillator system. For the at. heat at const. vol. (C_v), the following expression is deduced: $C_v = dU/dT = 3R(1-6\sigma RT)$, where the quantities have their usual significance. From exptl. data it is shown that $C_v = 5.8546 + 0.000649T$.
H. J. C. (*C. A.*)

40. Weighing by substitution. C. A. Briggs and E. D. Gordon. Bur. of Standards, *Tech. Paper,* **208,** 177–92(1922).—Sp. directions are given for weighing by substitution, as developed by the Bur. of Standards for the testing of large weights. This paper is written especially for makers of scales and weights.
C. E. Carlson (*C. A.*)

41. A new occurrence of cristobalite in California. A. F. Rogers. *J. Geology* **30,** 211–6(1922).—In obsidian from San Bernardino Co. (n = 1.483, ± 0.003), are rod-shaped crystallites in parallel lines, and spherulites 5–25 mm. in diam. The solid

portions of the spherulites consist of orthoclase and cristobalite, in fibrous aggregates which on microscopic examn. prove to be intergrowths. Other minerals identified include tridymite, opal, magnetite and fayalite. The cristobalite was formed at a high temp. and as the temp. became lower, tridymite appeared, and at about the same time fayalite and magnetite. The opal is the only mineral formed by ordinary solns.

W. F. H. (*C. A.*)

42. The representation of igneous rocks in triangular diagrams. ALBERT JOHANNSEN. *J. Geol.*, **30,** 167–9(1922).—By means of a dot and a line J. plots, without the use of a slide rule or any calcn., the actual % of quartz, orthoclase, plagioclase, and dark minerals, as well as their relative % among the light constituents. W. F. H. (*C. A.*)

43. Sizes of atoms in crystals. R. N. PEASE. *J. Am. Chem. Soc.*, **44,** 769–74 (1922).—It is shown that the contribution of an atom to the distance between it and another in a crystal depends on the no. and arrangement of electrons about its positive nucleus, on the type of lattice, at least as this affects the lattice, and, ordinarily, on the magnitude of the charge carried by the atom, and that the particular element is of secondary importance, *for elements whose atoms are of the same rare-gas type.* The inter-at. distances in crystals of the diamond type of lattice have been analyzed from this point of view. H. JERMAIN CREIGHTON (*C. A.*)

44. The influence of the concentration of colloids on their precipitation by electrolytes. H. B. WEISER AND H. O. NICHOLAS. *J. Phys. Chem.*, **25,** 742–57(1921); cf. *C. A.*, **16,** 1351.—The colloids, hydrous chromic oxide, Prussian blue, hydrous ferric oxide, and arsenious sulfide were used with 1- and 2-, and 3- or 4-valent pptg. ions. The pptn. values of all electrolytes decrease as the concn. of the colloid is lowered in all cases except As_2S_3 with univalent pptg. ions. With As_2S_3 the pptn. value of electrolytes with univalent pptg. ions increases with decreasing concn. of colloid. The 2 opposing tendencies due to diln., the smaller concn. of colloid which required less pptg. ion to neutralize it, and the greater dispersion which required a greater concn. of pptg. ion to secure collisions, have been assumed to be the principal factors in detg. the relation between concn. and pptn. Another more important factor is the effect of the adsorbability of the oppositely charged ion which may be absorbed and stabilize the colloid. F. E. BROWN (*C. A.*)

45. Studies on specific heats. III. M. PADOA. *Gazz. chim. ital.*, **52, I,** 25–9 (1922); cf. *C. A.*, **15,** 1844.—In the preceding paper P. showed with exptl. data that the multiplication and intensification of bonds between atoms in solid polymerized compds. produces a marked diminution of the sp. heat. Reasoning in the same way elements whose sp. heats are markedly lower than required by the law of Dulong and Petit ought to have a considerable no. of valences. In solid solns. of an element abnormal in this respect in an excess of an element normal in its sp. heats, it should be possible to detect an increase in the sp. heat of the abnormal element. Abnormal elements capable of giving solid solns. in normal elements are not numerous. C is sol. in Fe only to the extent of 2% and could not be used. Si, however, forms solid solns. up to 18% Si in Fe. Detns. of the sp. heat of alloys contg. 10.14, 33.6 (FeSi), 50, 75, 85 and 95% Si gave values for the at. heat as follows: 6.42, 6.04, 5.27, 4.83, 4.78, 4.75 and 4.74, resp. The data for FeSi were taken from Schimpff (*Z. anorg. Chem.*, **71,** 257(1910)). The results show that the sp. heat of Si rises in solid solns. as the diln. increases although an extra high value (6.64) was taken for Fe. "The formation of the solid solns. thus corresponds to a pulverization into free atoms of Si and produces the effect of restoring to them the degree of freedom necessary in order that the energy content proper to the thermal oscillations may rise to the level characteristic of most of the metals." Results equally satisfactory for Se in the system S-Se were obtained. In the system S-Se solid solns. contg. 4, 9, 28.77, 90.35% (rhombic and monoclinic

forms of this mixt.) at. heats for S of 7.03, 6.00, 5.87, 5.50, 5.78, resp., were obtained. Here also the at. heat is max. for the greatest diln. of S. In Se-Te in which both components are normal the sp. heats were additive, as they should be. E. J. W. (*C. A.*)

46. A simple formula for calculation of the specific heats of solids. H. J. KRASE. *J. Am. Chem. Soc.*, **44**, 784–6(1922).—This is an empirical equation for representing the empirically and graphically found values given by Lewis and Gibson (*C. A.*, **12**, 14). The agreement is out 30% or so at very low temps., is good to about 2.5% at the characteristic temp. Θ, the temp. for each substance for which C_v (per gram atom) = 2.96, and to 2 to 4 per mille if T is 1.6 or more times Θ. The equation is: $C_v = 2.91 + 2.89 \tan h\, 2.95 \log T/\Theta$. W. P. WHITE (*C. A.*)

Refractories and Furnaces

47. The composition and micro-structure of clays and their fusibility at high temperatures. LEON BERTRAND. *Ceramique*, **25**, 153–157(1922).—The relation between the Al_2O_3 content and fusibility of 101 clays were studied and the results are summarized in the following table:

% Al_2O_3	No. of clays	Softening temps. °C	% Al_2O_3	No. of clays	Softening temps. °C
39	1	1840	25	5	1450–1790
38	1	1850	24	4	1450–1800
37	1	1830	23	8	1390–1790
36	3	1190–1830	22	7	1440–1790
35	2	7790–1800	21	3	1270–1730
34	4	1810–1830	20	3	1120–1770
33	7	1670–1810	19	1	1450
32	2	1750–1810	18	1	1720
31	6	1670–1810	17	1	1650
30	3	1700–1790	16	4	1160–1710
29	5	1690–1790	15	1	1650
28	7	1430–1810	14	2	1460–1690
27	7	1500–1770	12	2	1390–1670
26	9	1470–1770	8	1	1650

The clays were classified into three groups as follows: I.—Clays containing more than 29% Al_2O_3 (more than 32% for fired clays). All clays in this group were fire clays having a softening point above 1650 °C. II.—Clays in this group contain 20–28.9% Al_2O_3 (21.5–32% Al_2O_3 for fired clay). This group consisted of 53 clays softening between 1120–1810 °C and 39 of these soften above 1650 °C. III.—Clays in this group contain less than 20% Al_2O_3 (less than 21.5% Al_2O_3 for the fired clay). This group contains 13 clays which soften between 1160–1710 °C of which 7 soften above 1650 °C. Since those clays which have the highest Al_2O_3 content are generally the most refractory B. recommends that a minimum Al_2O_3 content be specified for clay refractories.

H. G. SCHURECHT

48. Open hearth furnace design. A. D. WILLIAMS. *Iron Age*, **109**, 577–9, 717–9, 853–5, 1075–6(1922); cf. *Ceram. Abs.*, **1**, 108(1922).—Design, computations and figures are based on known principles and chem. reactions that take place. The calcn. of the hearth area is such as to give a metal depth of about 29 in. in a 100-ton furnace. The inclination of parts varies with practice, being a function of speed vols., etc. The velocities of the gases det. the inclination of ports and similar openings. Regenerator computations for wt. and vol. of checker work require 50 to 70 lbs. per lb. coal burned per

reversal, the temp. changes being based on the time of reversals. For frictional resistance in the design of checkers and flues the formula of Mojarow is used. Calcns. of the gas and air necks, flues, etc., are also based on this formula. The consideration of the port areas and velocities of the gases is affected by the pressures as are also the angles and locations. The pressure of the gas may be from $^1/_2$ to 1 in. of water, but not more than the capacity of the flues for carrying off the gases. The height of the stack varies, depending on the use of auxiliary draft appliances.

W. A. MUELLER (*C. A.*)

49. Chromite deposits of Bahia, Brazil. H. E. WILLIAMS. *Eng. Mining J.*, **111,** 376–8(1921).—There is a large chromite deposit near Santa Luzia; lenses with amphibole in a quartzose gneiss. Extensive mining was carried on during the war.

E. F. H. (*C. A.*)

50. Alunite deposits in United States. RICHARD H. TINGLEY. *Rock Products,* **25,** No. 6, 38–43(1922).—A popular account of some of the alunite deposits in Utah and the prices and extent of the demand for K, alum and H_2SO_4 in the U. S. Roasting and treating with H_2O is the process proposed. The crude Al_2O_3 remains behind and the K_2SO_4 goes into soln.

J. O. HANDY (*C. A.*)

51. The preparation of refractory bodies for temperatures over 2000° in furnaces with reducing atmospheres. OTTO RUFF. *Forschungsarbeiten Gebiete des Ingenieurwesens,* **1914,** No. 147, 31 pp.—The only oxides or furnace linings which are sufficiently high-melting, non-volatile and resistant at 2000° to the reducing atm. of a C resistor are BeO, MgO and ZrO_2. Of these three ZrO_2 alone is practical; BeO is too expensive and MgO too volatile. The 2 latter can serve only as fluxes. Impervious crucibles can be prepd. from ZrO_2 which are resistant up to 2200° in an evacuated C resistance furnace. The addn. of dry starch makes ZrO_2 more easily molded. MgO increases the shrinkage at low temp., but gradually disappears at temps. above 2000°. Entirely impervious crucibles of ZrO_2 have not yet been made. The prepn. of impervious crucibles with TiC is very difficult; it is facilitated by the addn. of a small amt. of other carbides although good vitrification has not yet been obtained. The requirement is that the m. p. and the vitrifying point must occur at a rather wide difference of temp. ZrC_2 is about the only other carbide sufficiently stable to serve as the basic material for such crucibles. Suitably glazing porous C crucibles may prove possible and further work along that line is promised.

H. I. MATTILL (*C. A.*)

52. Vanadiferous asphaltites of central Peru. J. G. BARAGWANATH. *Eng. Mining J.*, **111,** 778–81(1921).—Vanadiferous asphaltites of the impsonite type are found in Junin and Lima, along the western Cordillera of the Andes of central Peru. They occur in lenses in limestone, and contain as much as 16% ash, 2–5% S, 1% V. Several analyses are given. Attempts to extract the V by burning and treatment of the ash have proven unprofitable.

EDW. F. HOLDEN (*C. A.*)

53. Cleaning producer gas without washing. J. H. MATHESON. *Iron Age,* **109,** 916–7(1922) 4 figs.—Description and advantages are given of an installation for mixing the gases from several producers and removing the dust therefrom by an impact and settling process. A saving of 20–25% of the fuel is made. The dust recovered is valuable as a fuel.

J. L. WILEY (*C. A.*)

54. Chemistry and physics of gas works refractories. T. F. E. RHEAD. *Gas World,* **76,** 225–7, *Gas J.*, **157,** 633–6(1922).—Attention is drawn to the influences of grading, proportioning, mixing, molding pressure, burning, etc. J. L. WILEY (*C. A.*)

55. The application of electric power in the iron and steel industry. W. S. HALL. *Assoc. Iron Steel Elec. Eng.*, **4,** 127–51(1922).—H. discusses the various sources of waste heat from steel plants and its conversion into elec. power. Also in *J. Western Soc. Eng.*, **27,** 145–57(1922).

W. E. RUDER (*C. A.*)

56. California silica sand operations. (GUNNEL) **18.** Preparation of refractory bodies for temperatures over 2000° (RUFF) **4.** (*C. A.*)

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57. Carbon electrodes; abrasives. W. G. MICHEL. Brit. 174,529, Feb. 11, 1921. C electrodes for electrolysis, furnaces, arc lamps, or batteries, are made of abrasive bodies, such as are used for grindstones, emery wheels, and hones, by compressing the powdered C, emery, carborundum, etc., in a mold, exhausting air from the mold, allowing heated binding material to permeate the powder, and baking the resulting bodies. A suitable construction is specified. Cf. *C. A.*, **15**, 3033. (*C. A.*)

58. Electric crucible furnace. W. S. HADAWAY, JR. U. S. 1,410,566, Mar. 28, 1922. (*C. A.*)

59. Electric arc furnaces. F. VON SCHLEGELL. Can. 216,774, Mar. 14, 1922. A pair of parallel electrodes is inserted in a chamber in proximity to each other in such a way that the distance between them may vary under the influence of the magnetic fields set up in the furnace. An auxiliary electrode movable to contact with the pair of electrodes to form an arc may also be provided. (*C. A.*)

60. Manufacture of refractory and insulating products. G. L. DIMITRI AND J. E. DELAUNAY. Can. 217,417, Apr. 4, 1922. A natural Mg silicate is mixed with other silicates; the mixt. is compressed, dried, formed into blocks and fired at about 1450° in a muffle furnace. The compression may take place in a vacuum. Cf. *Jour. Amer. Ceram. Soc.*, **4**, 865 (1921). (*C. A.*)

61. Electric furnace for zinc purification. H. TSUBOI. Jap. 38,656, May 14, 1921. Diagrammatical description of an elec. furnace for purification of Zn by distn. A plug having a small hole is put in the delivery hole of the condensing chamber, by means of which formation of powdered Zn is prevented. (*C. A.*)

62. Tilting electric furnace. W. E. F. BRADLEY AND A. B. BRADLEY. U. S. 1,411,158, Mar. 28, 1922. (*C. A.*)

63. Electric crucible furnace. C. H. CARPENTER. U. S. 1,409,669, Mar. 14, 1922. (*C. A.*)

64. Refractory cover for electric furnaces. M. S. CLAWSON. U. S. 1,410,654, Mar. 28, 1922. (*C. A.*)

Abrasives

65. Corundum Industry in the Northern Transvaal. A. L. HALL. *South African Jour. of Indus.*, **5**, 153(1922).—The Transvaal corundum fields extend over some 2000 sq. m. The keen competition in the industry has necessitated changed methods of recovery and grading. The principle of concentration of corundum from crushed reefs by mech. methods similar to those used in tin mines, has been thoroughly tested and in this way it has been demonstrated that superior grain corundum of marketable quantity can be economically produced in the Transvaal fields by methods much less elaborate than those in use at the famous Craigmount Mill in Canada, now burnt down. Crushing, concg., and grading are fully described with an accompanying "Flow Sheet." A wheel made of this grain corundum passed a severe test in London very satisfactorily. Since it is possible to produce well-graded commercial grain corundum of high quality economically, and to furnish abrasive material of great purity and high alumina percentage, the general outlook of this new industry in South Africa is distinctly encouraging. O. P. R. O.

Stoneware, Whiteware and Porcelain

66. The use of electrolytes in the purification and preparation of clays. H. G. SCHURECHT. *U. S. Bureau of Mines Tech. Paper*, **281**(1922).—The following subjects are covered: (1) relation of salt to clay in the purification of clays, (2) use of

H_2SO_4 in the sedimentation of clays, (3) effect of electrolytes when added to plastic bodies, and (4) effect of wet grinding, screening, electrolytes and dextrine on clays of low plasticity. H. G. S.

67. The grinding and preparation of raw materials in the whiteware industry. B. Wilde. *Keram. Rundschau*, **30**, 167, 168(1922).—With the substitution of machinery made for handmade ware, the proper preparation of the bodies becomes more important. The grinding mills should be set up in a clean, well lighted place and the floor of the grinding room should be of cement or tile with sufficient grade to allow them to be easily cleaned and drained. Extreme cleanliness is necessary in the grinding room, the mills should be cleaned every evening and no one should be permitted to enter with soiled shoes. The room should be well heated and lighted in the winter to allow the men to work more efficiently. Drops of oil from machinery should not be allowed to enter the clay since these contain iron which would discolor the ware. The blunger and agitators should be covered. As much as possible of the equipment should be made of wood instead of iron. Before mixing water with the clay the latter should be thoroughly dry since wet clays do not mix as easily as dry clays. H. G. Schurecht

68. Manufacture of culinary ware. F. Bigot. *Rev. Mat. Constr. Trav. Pub.*, **151**, 53B–54B, **152**, 68B–71B (1922).—The making of culinary ware from clays found at Vallauris, Switzerland. Chemical analyses of the clays found at different depths are given. Louis Navias

69. Proper design of porcelain insulators. J. F. Scheid and W. Weicker. *Elektrotechn. Z.*, **43**, 564–5(1922). C. G. F. (*C. A.*)

PATENTS

70. Molding earthenware, etc. W. A. van Dijk. Brit. 174,918, Jan. 16, 1922. Earthenware, etc., is molded by introducing the prepd. liquid material into a rotating mold having recesses corresponding in shape to the required articles, the material being forced into the recesses by centrifugal force. Exterior projecting wall portions may replace the recesses, and cores for hollow articles may be provided. (*C. A.*)

Art and Design

71. The use of secondary reference standards in process problems of color measurement. H. S. Busby. *Amer. Soc. Test. Mat.*, **21** (1921).—A discussion covering the fundamentals and practical problems involved in setting up an effective textile color lab., for routine color testing of the material of regular process problems. Application and discussions. F. H. R.

PATENTS

72. Plating on porcelain or glass. S. Yunoki and Y. Nakazawa. Jap. 38,689, May 21, 1921. Lavender oil or an aq. soln. of Ag_2O is painted on porcelain or glass and heated at about 600° in a muffle furnace, whereby Ag_2O is fused on the surface which is further plated by a suitable method. When the m. p. of the material is not high, a mixt. of 1 pt. Ag_2O and 0.1 pt. solvent, made of 1 pt. minium, 2.2 pts. borax and 0.5 pt. Bi oxide, is used instead of Ag_2O and heated at about 380°. (*C. A.*)

Heavy Clay Products

73. Building tile from slag. Anon. *Contract Record*, **63**, 361(1922).—The National Slag Products Ltd. was incorporated in July, 1921, under Dominion Charter for the purpose of mfg. hollow building tile from granulated blast furnace slag, a waste material secured by long term contract from the Steel Company of Canada, Hamilton, Ont. Capital $300,000. The plant is situated at Hamilton and production was to have started May 1, 1922. O. P. R. O.

74. The making of clay brick. CH. BRAILLION. *Rev. Mat. Constr. Trav. Pub.*, **152,** 74B (1922).—B. refutes the assertion that lime-silica brick can not be made with argillaceous sands. Sands containing up to 20 per cent clay were mixed with slaked lime, and made into good brick, without any difficulty. A mixture of pure clay and lime gave a resistant product. Special precautions have to be taken when pure sand and clay are used with the lime. LOUIS NAVIAS

75. A new building material. ANON. *Raw Materials Review* (London), **1,** 54 (1922).—Paul Atterfelt, of Gothenburg, Sweden, has contrived a new building material made of a compn. of wood fibre, by which complete buildings, walls, etc., of any kind may be made. While one cu. m. of brick costs 144 kronen finished today, the cost of the new material would only be 35 kronen. It is particularly easy to work, and can be sawed and planed. It has a large bearing surface, and has almost double the heat-insulating value of wood. O. P. R. O.

76. Treatment of silicates for alkaline sulfates. (A process by E. Levitt, of Montreal, Canada). ANON. *Raw Materials Rev.* (London), **1,** 54(1922).—According to this specification, silicates such as potassium-bearing silicates and clays are fused with boron trioxide or any substance that yields boron trioxide at a high temperature, and then treated with sulfur dioxide. Bisulfites of the metals present pass into soln., while silica remains undissolved and is filtered. The filtrate is boiled, sulfur dioxide is evolved, the bisulfates converted to sulfites, and aluminium pptd. as hydroxide. The ppt. is then filtered, and the filter boiled, thus dioxidizing with access of air the sulfites to sulfates. O. P. R. O.

Glass

77. Recuperative glass furnace. ANON. *Glass Worker,* **41,** No. 34, 11(1922).—The new Chapman-Stein furnace is described. Increased capacity, longer life of pots, reduced fuel consumption and better temp. control is claimed. R. J. M.

78. Some aspects of science applied to the glass industry. C. H. KERR. *Glass Industry,* **3,** 69–71(1922). J. B. PATCH (*C. A.*)

79. The production and properties of optical glass. F. WEIDERT. *Glashütte,* **51,** 774–5, 787–90, 803–5, 819–21(1921); **52,** 1–3, 17–18(1922), 9 illus.—See *Ceram. Abs.* **1,** 116 (1922). J. B. PATCH (*C. A.*)

80. Specifications for lime-flint glass tumblers. ANON. Bur. Standards, *Circ.*, No. **119,** 1–3(1922). G. E. BARTON (*C. A.*)

81. Pyrex: a triumph for chemical research in industry. W. H. CURTISS. *J. Ind. Eng. Chem.*, **14,** 336–7(1922). J. B. PATCH (*C. A.*)

82. A radiation electric glass furnace. V. M. SAUVAGEON. *Chimie et industrie,* **7,** 452–5(1922).—Outline of the expts. carried out by S. from 1908 to 1914. The first furnace, heated entirely by passing the current through the charge, was not satisfactory because the heat was too concd. and caused rapid wear of the pot, while the passing of the current through the glass prevented obtaining a flawless product. In the next furnace, a heating element was placed in the roof of the furnace and the current was also passed through the charge, and finally all the heating elements were placed in the roof and the walls and no current was passed through the charge. In this last furnace the lower portion, built of refractory materials, comprised a seat for the melting pot, raised in such a manner that natural ventilation could take place under the floor supporting the pot. The walls and roof were of MgO, contg. at least 7% Fe oxide. There were 3 chambers, each contg. a resistor of fine-grained petroleum coke (which became graphitized when the furnace started up), and the electrodes passed through the ends of the furnace. Above each chamber is an opening which allows the inspection of the resistor, even when the furnace is running, and by means of which the coke is renewed.

The roof and walls were purposely made quite thick. Single phase a.c. was used. The furnace was run from June 11 to July 18, 1914, when it had to be shut down through wearing out of the pot. The roof and walls were taken down for inspection and were seen to be in excellent condition. The tests showed: The furnace is of sturdy construction, easily inspected, even when running, and simple to control. It can be started up directly. Interruption of the current involves no drawbacks other than stopping of production during the time the current is off and the time required for bringing the furnace back to its working temp. It is perfectly safe, as there is no current passing through the working part of the furnace. There is no deterioration or transformation of the charge. Temps. all the way up to 1,425° can be obtained and maintained very closely. The roof was constructed too thick. Reduction of the thickness would allow of higher temp. and better yield per kw. Good quality glass can be manufd., and with some minor changes the furnace is suitable for com. operations. Owing to high and const. temp., better and more resistant glasses can be obtained, and more particularly SiO_2 glasses with a high insulating power. The tests are being continued.

A. P.-C. (*C. A.*)

PATENTS

83. Glass. W. C. Taylor and H. P. Gage. U. S. 1,411,133, Mar. 28. A glass opaque to visible light in plates 6 mm. or more in thickness is formed by the addition of MnO_2 6% and Cr_2O_3 0.5% ($K_2Cr_2O_7$ 1%) to a SiO_2 46, PbO 33 and K_2O 14 part glass. U. S. 1,411,134 relates to production of similar glasses. (*C. A.*)

84. Care of glass melting pots. H. W. Hess. *Glass Worker*, **41**, No. 29, 14, 22, 24(1922).—In heating the pots in the pot arch uniformity of temp. is of greater importance than the length of time consumed in reaching the max. temp. of 2100–2200° F. The moisture is driven off at 230° F., and the greatest loss in wt. occurs between 900° and 1200° F. J. B. Patch (*C. A.*)

85. The action of iron and other metals upon clay and glass. H. W. Hess. *Glass Worker*, **41**, No. 27, 12, 36(1922).—When introduced with the batch pieces of Fe, Cu, brass and Pb have little or no effect upon the pot itself. If the metal is introduced after the metal is planed decided erosion takes place upon the refractory container.

J. B. Patch (*C. A.*)

86. Control of pot furnace conditions. H. W. Hess. *Glass Worker*, **41**, No. 32, 11, 29, 30(1922).—The essential uniformity of heating can only be obtained by intelligent pyrometric control. J. B. Patch (*C. A.*)

87. Magnetic separation in glass plants. R. A. Manegold. *Glass Worker*, **41**, No. 30, 11, 29(1922).—The magnetic separator is useful in removing tramp Fe from cullet and in reducing the Fe content of sand. J. B. Patch (*C. A.*)

88. Unbreakable glass? Anon. *Fachgenosse*, **38**, 39–40(1922).—The new glass, Silex, made by Horak, is composed of 98% quartz. Its coeff. of expansion is so small that beakers and flasks with 1-mm. walls withstand abrupt temp. changes of 400°. The glass is also very resistant to severe shock tests although not unbreakable. The color is described as smoky yellow; the color is due to the action of S_2 in the fuel. Silex is expected to replace metal and enamelled cooking utensils. J. B. Patch (*C. A.*)

89. Determination of the surface of glass powder. Hans Wolff. *Z. angew. Chem.*, **35**, 138–40(1922).—A soln. of 290 g. Na_2CO_3, 10 H_2O and 50 g. NaOH, pure and especially free from iron, was placed in a silver vessel heated on a water bath to 95°, and allowed to act (*a*) for 2 hrs. on glass plates of known sizes held in clamps, and (*b*) for ½ hr. on carefully sieved and washed glass powder of the same compd. as the plates, and agitated by stirrers of special form driven at 300 and 400 revolutions per min., resp. Loss in wt. of plates and powder was detd., calcd. to loss for 2 hrs., and the surface of the powder then computed from the equation: surface of powder/surface

of plates = loss in wt. of powder/loss in wt. of plates. For purposes of comparison such results were then reduced to "surface per gram" and "surface per cc." It was found that plates must be of the same kind of glass as the powder to be examd., and that the ways different kinds of glass splinter vary widely. Values for the surface of the same glass vary about 5–6% from the mean, and those for different kinds of glass by 20–30%. Expts. were carried on with 3 kinds of Jena glass, a window glass and glass for photographic plates, the Jena glass showing relatively smaller areas per g. and per cc. (and also lower hardness) than the other varieties. W. C. EBAUGH (*C. A.*)

90. Heat distribution in the glass factory. ANON. *Nat. Glass Budget*, **37**, No. 50, 8–9(1922).—The Denk Engineering Co. gives the following heat balance of producer gas as typical for glass furnace conditions: 20% of the total heat value of the fuel is lost in the producer, 5% in the gas line, 4% in the chamber, 32% in the furnace and 26% in the stack. The useful heat consumed by the glass is thus 13%. Proper insulation and clean gas are recommended to reduce the losses. J. B. PATCH (*C. A.*)

91. Annealing and the mechanical properties of glass. TAFFIN. *Compt. rend.*, **174**, 159–62(1922); cf. *Ceram. Abs.*, **1**, 216(1922).—Using the mathematical expression developed in a previous paper T. dets. the effect of forces applied to prisms of glass on the birefringence of the glass. The force necessary to cause a continuous deformation of glass at 410° corresponds to the value that may be obtained from the mathematical expression. Conclusion: The annealing of glass is a viscous deformation due to internal forces. L. H. RYERSON (*C. A.*)

92. Determination of sulfate-, chloride-, and carbonate-ions in soda-lime glass. MASAO IKAWA. *J. Chem. Soc. Japan*, **42**, 768–85(1921).—I.'s new method is based on the use of NH_4FHF to dissolve the glass instead of HF. Since the com. fluoride contains $PbSO_4$, PbF_2, NaF, Na_2SO_4 and Fe as non-volatile impurities, and NH_4 salts of H_2SO_4, HCl, H_2SiF_6 as volatile impurities and sometimes free H_2SO_4 and $(NH_4)_2SO_3$, a special method of purification is necessary according to the ion to be detd. SO_4-free fluoride is prepd. as follows: Into a hard glass flask 3 l. capacity (need not be Pb flask), about 400 g. of silicate powder (or common glass powder) mixed well with 200 g. of NH_4FHF are placed, and treated gradually with com. H_2SO_4. The resulting SiF_4 is led into 2 l. of H_2O in which H_2SiF_6 is formed (the clogging of the end of the tube by H_2SiO_3 is prevented by a little Hg placed in the flask). After the H_2SiO_3 is filtered off, the H_2SiF_6 is first neutralized with NH_4OH, and then decompd. by adding a large excess of NH_4OH. The clear filtrate is transferred to a Pt dish. NH_3 is driven off, and on cooling NH_4FHF crystallizes out. The crystals, after being freed from H_2O as much as possible, are purified by sublimation. The product is free from SO_4. The powd. glass to be analyzed is decompd. with about 9 g. of the purified NH_4FHF. If the fluid is neutral or alk. to litmus, more fluoride should be added. The resulting residue is dissolved in a small amt. of warm H_2O (the small insol. residue is CaF_2). The filtrate from the CaF_2 is neutralized with SO_4-free Na_2CO_3, and heated, filtered, and the residue washed 3 times on filter paper with dil. alc. (1:1). The filtrate is concd. to approx. ½, acidified with excess of $H_2C_2O_4$ and heated. The filtrate from the $H_2C_2O_4$ is evapd. to dryness and the excess $H_2C_2O_4$ destroyed by gentle ignition. The residue is dissolved in dil. HCl, filtered and the SO_4 detd. by $BaCl_2$ as usual. For Cl detn., the com. fluoride is freed from Cl by $AgNO_3$. The filtrate is treated with NH_4OH, and again filtered. From the filtrate, NH_4FHF is crystd. by concn. and cooling, and purified by sublimation. About 5 g. of the sample glass should be used for a Cl detn. For CO_3 detn., the crude fluoride is dissolved in H_2O, and treated with NH_4OH. The filtrate is evapd. in a Pt dish to drive off NH_3. The residue is recrystd. Then about 15–20 g. of glass powder is decompd. by the fluoride and CO_2 is detd. by a slight modification of Fresenius-Classen's method. The results of analyses of various im-

ported window glasses show that SO_4 (as Na_2SO_4) varies from 0.667 to 1.045%, non-sulfate S (as Na_2SO_4) from 0 to 0.108%; Cl as NaCl from 0.066 to 0.154%; and CO_3 as Na_2CO_3 from 0.021 to 0.055%. S. T. (*C. A.*)

93. The action of metallic lead in pots. Henry W. Hess. *Glass Worker*, **41**, No. 28, 14, 22(1922).—Six duplicate tests using finely divided Pb in place of litharge yielded a first class glass and the pot bottom showed no ill effects. The Pb button sometimes found on pot bottoms is believed to be harmless, at least as far as chem. action on the pot is concerned. J. B. Patch (*C. A.*)

PATENT

94. Means for feeding goods into and removing goods from annealing and other furnaces. Martin van Marle. England, 1,402,551, Jan. 3, 1922. Apparatus for charging or discharging furnaces, comprising (1) a traveler adapted to move transversely, (2) a cross frame carried by the traveler having rails, (3) a goods carrying carriage mounted on the cross frame and adapted to move on the rails, (4) longitudinally disposed goods-carrying bars movably mounted above the carriage and adapted to carry the goods into or remove them from the furnace (5) means for raising and lowering the bars on the goods carriage, (6) means for moving the carriage longitudinally to carry the goods bodily into the furnace. C. M. Saeger, Jr.

Cement, Lime and Plaster

95. Cement industry. Punjab, India. Anon. *Jour. Royal Soc. of Arts*, **70**, 505.—It has been said that the measure of a country's prosperity may be gauged in these days of industrial progress by the extent of its cement interest. The recent industrial awakening of India has generally synchronized with the development of the manuf. of Portland cement in various ports of the Peninsula. The Governor is to possess a cement factory of his own. The site for the plant is Wah, in an area of an almost inexhaustible supply of limestone and clay of admirable quality for the manuf. of first-class Portland cement. Abundant supply of clear cold water from the Himalayas is available here. The whole of the plant will be driven elec. by a steam-driven turbogenerator of 1,500 kw.—probably the most modern unit of its type in the Punjab. O. P. R. O.

96. Gypsum in British Columbia. A. G. Bangley. *Ann. Rept. B. C. Minister of Mines*, G. **129**(1921).—A deposit of gypsum occurs along the North Bank of the Bull River in the Eastern District of B. C. at a distance of about three miles from the main road to Fort Steele and within a short distance of the falls and the Kootenay Central Railway. The deposit has considerable overburden but shallow diggings have uncovered the mineral, and from all indications there is a large deposit conforming to the dip and strike of the formation. The analysis of a representative sample gave the following results: Gypsum, 80.5; carbonate of lime, 14.4; insoluble, 3.5; magnesium oxide, 0.6; organic matter, 0.8. Another large deposit of gypsum has been opened near the railway at Kelly Lake in the Lilloeet District. O. P. R. O.

97. Standard specifications for Portland cement. Anon. *Canadian Eng. Standards Assoc.*, (1922).—The specification is based on the recommendation of the Engineering Institute of Canada, but agrees substantially with the Tentative American Standard Specification, while certain clauses have been adopted from the British Standards Specification. It takes into account the most modern developments of cement manuf. testing and use, both on this continent and Europe. Chem. properties, phys. properties, packing and marking, inspection and rejection of cement are outlined. This specification differs from the American and British Standards in cases where Canadian conditions require distinctive treatment. O. P. R. O.

98. New methods for proportioning concrete. R. B. Young and T. V. McCarthy. *Canadian Engineer,* **9,** 263–65.—Basis of the new theory is the idea of proportioning concrete to develop desired minimum strength in a specific time. Four classes of concrete have been established by the Hydro-Electric Power Commission, each to develop stipulated strength at the age of 28 days: (1) Class A, 2,500 lb. per sq. in. (2) Class B, 2,000 lb. per sq. in. (3) Class C, 1,500 lbs. per sq. in. (4) Class D, 1,000 lb. per sq. in. These correspond roughly with the common proportions 1:1½:3, 1:2:4, 1:2½:5, and 1:3:6. This plan is much more logical than specifying a set of mixts. because, for example a 1:2:4 mix may under certain conditions give a strength as low as 500 lbs. per sq. in., and under more favorable conditions a strength of 4,000 lbs. per sq. in. To the man in the field consistency is a more important feature than strength. Nevertheless he controls to a great extent, the strength of the resulting concrete by making the consistency conform to an adopted standard. The Hydro-Electric Power Commission has attempted to proportion concrete, not only for a given strength but for a given consistency. This was impossible by the former methods of proportioning and mixing but the development of this new method makes a stated strength and a stated consistency possible. The Commission has also used the water-cement-ratio strength relationship, changing the ratio to correspond to weights rather than to volumes, in order to facilitate the work of proportioning. The Commission has chosen the conditions under which the minimum variations occur and has found the theory most successful. A standard consistency has been arrived at by trial and the quantities of water necessary to produce this consistency have been determined for various mixes. The denser the concrete the greater its strength. It is possible to predict within a few hundred pounds the possible strength of concrete proportioned by the new method. O. P. R. O.

99. On the choice of materials for use as sand in hydraulic mortars. R. Feret. *Rev. Mat. Constr. Trav. Pub.,* **150,** 45–49, **151,** 71–76, **152,** 85–90(1922).—*First series.* Mortars were made by mixing by weight 1 part of Portland cement and 3 parts of sand. The sand or material representing it in the mortar was separated into divisions of large grains G, (passing through screen of 5 mm. diameter hole but held by 2 mm.), medium sized grains M, (through 2 mm. but held by 0.5 mm.), and fine sized grains F, (those passing thru 0.5 mm.) Equal weights of each size were taken and mixed to represent the material. The materials tested were *natural rocks* as (A) porphyry, (B) granite, (C) siliceous stone, (D) ferruginous stone, (E) calcareous stone—50% lime, (F) marble, (G) chalk, (H) crushed shells, (I) flint, (J) schist, quartzite in (K) angular grains, (L) lamellar grains, and (M) rounded grains, (T) feldspar, substitution of 2.5% (U) mica, 5% (V) pyrites, 33% (A^1) dry clay, and 33% (B^1) mud, separately in the quartzite mixture. The effect of *substances having chemical action on cements,* (P) crushed new brick, (Q) cinders, (R) slag—(used in cements): substitution of 33% (W) trass-volcanic product, 33% (Y) manganese dioxide, 7% (Z) sawdust, 33% (C^1) coal ashes 33% (D^1) wood ashes, separately in the quartzite mixtures. Inert substances as (O) pumice stone, (N) crushed glass, (S) wood charcoal: substitution of 66% (X) broken pieces of unground cement in quartzite mixture. The materials were mixed with enough water to give them the same plasticity, for the mortar, and then molded into briquettes. After hardening in the air 7 days, the mortars were immersed in sea water and tested after periods of 12 weeks, 1, 4 and 10 years. Data given in tables: proportions of mixtures, weights of water needed for mortar, change of weight of 1 liter of mortar on standing, and tensile strength after each period of immersion. Tests on 10 year immersion samples only:—(1) stamp test (directly proportional to compression strength). The center of a crushed sample was powdered and treated as follows:—(2) 5 gm. were dried to constant weight in a sand bath—the loss in weight indicating the amount of

water held in the pores by capillarity, (3) 5 gm. were put into 150 cc. of a 10% sugar solution in a stoppered flask, and frequently shaken: at the end of 24 hours the liquid was filtered and the lime dissolved in it was determined by hydrochloric acid, the results giving a relative idea of the proportion of free lime found in the different mortars. From these data the amount of free lime found in the dried mortar was calculated. *Results.* Only slight differences in strength were noted where rock substances A-M, T and U were used. Compression tests after 10 years immersion gave, when calculated so that value of (K) ground quartzite is 100:—(P) 165, (X) 141, (I) 139, (N) 134, (V) 113, (Q) 107, (C^1) 104, (M) 103, (D) 103, (A) 101, (K) 100, (W) 97, (T) 96, (A^1) 93, (Y) 92, (H) 91, (L) 90, (F) 88, (E) 83, (C) 83, (B) 81, (U) 81, (R) 67, (D^1) 65, (J) 58, (B^1) 56, (Z) 39, (G) 29, (O) 25, (S) 8. The rounder the grains of the material, the greater the strength of the mortar. The introduction of dry clay did not change the strength of the mortar materially. Dry mud (containing much organic matter) lowered the strength considerably. *Second series.* Mortars were made with proportions of binder to sand of 1 to 3, and 1 to 7, by absolute volumes. With hydraulic lime the materials used were, (Q+R) quartzite, (P) granitic sand, (X) marble, (U) broken red ridge pieces. With Portland cement were mixed (Q+R), (P), (X), (U), and (Y) calcareous sand, (Z) calcareous oölite, (V) broken yellow ridge pieces, (T) crushed brick. Each material was sieved thru circular openings of diameters 5, 4.5, 4, 3.5, 3, 2.5, 2, 1.5, 1, and 0.5 mm. and thru screens of 80 and 180 mesh, that greater than 5 mm. was rejected. The 12 screened sizes were then mixed together, a constant weight being taken for each size. Enough water was used to give each mortar the same plastic consistency. The following data are given:—specific weights, and specific volumes of the materials, cements and mortars, tensile and compression strengths for test pieces kept in media of sea water, soft water and moist air for periods of 12 weeks, 1 year and 6 years, stamp tests for sea water samples after 30 years, immersion. If c and s represent the absolute volumes of binder and cement respectively in 1 volume of fresh mortar, it has been found that when the quantity $\left(\frac{c}{1-s}\right)^2$ is plotted against the corresponding compression or stamping strengths, for mortars made of the same binder and of different inert sands, and measured after immersion in the same medium for the same length of time, that the points lie practically on a straight line passing through the origin. (Several sets of data and graphs given.) Where there is pozzuolanic action, the points do not lie near the line-substances as non-granulated slag, granulated slag, trass, red and yellow ridge pieces, and crushed brick acting in this manner. *Third, fourth and fifth series* corroborate the above straight line relationship for other hydraulic binders, and for different grain size mixtures. *Sixth series.* Quartzite, marble, and dolomite in weight proportions of 5, 4, 3 and 2 to 1 of cement with about 14% water gave similar resistances for each proportion. For a constant immersion period in the same medium the compression strengths when plotted against the respective quantities $\left(\frac{c}{1-s}\right)^2$ gave a straight line relationship. *Seventh series.* Iron rust, iron ore and rusted grains of iron were mixed separately with Portland cement in varying proportions with and without sand. Denoting the absolute volume of the ferruginous material in a unit volume of mortar by m, then plotting the compression strengths against corresponding values of $\left[\frac{c}{1-(s+m)}\right]^2$ gave practically a straight line relationship. *Conclusions.* Mortars of most inert materials in the form of crushed rocks or sands with the same hydraulic binder are very similar in strength, and only differ in this property on account of grain size. The effect of grain size of the sand on compression strengths is neatly shown on

a triaxial diagram having G, M and F sizes (Q. V.) as apices, and curves of compression strengths of 310, 300, 250, 200, 150 and 100 kgs. per sq. cm. drawn on it. The mortar was that of 1 part cement and 3 parts quartzite. The maximum strength was obtained with a mixture of 5:1 of sizes G:F. The strength decreased very rapidly towards G and only slowly towards F and M. LOUIS NAVIAS

100. Sand-lime brick and sand-lime mortar. R. P. BROWN. *Rock Products*, **25**, No. 6, 36–7(1922).—Sand-lime brick contain approx. 10% by wt. or 25% by vol., of hydrated lime. If sand and lime mortar contg. 1 pt. of lime to 3 of sand be used for setting sandlime brick the structure will be practically monolithic and therefore of max. strength. The smooth working qualities of sand and lime mortar make even bedding of bricks easy. The mortar has a strength of 1622 lbs. per in.^{2} on an av. or 16 times the allowed safe load. It is also more adhesive than cement mortar. The crushing strength of cement mortar (1:3) was increased by 10% by substituting lime for half the cement. Ten % of lime added to cement mortar increased its adhesiveness (to bricks) by 130%. Bricklayers can lay 30 to 50% more brick per day in lime mortar.
J. O. H. (*C. A.*)

101. Lime burning in the rotary kiln. A. E. TRUESDELL. *Rock Products*, **25**, 24–30(1922).—A brief historical review of the art is followed by consideration of the main facts on which efficient plant design must be based. The rotary kiln handles spalls and other fine sizes most efficiently. Dust must not be used and fuel consumption is high if stone larger than 1½″ is used. Uniform burning and high output require close sizing and fine stone; 10% less fuel was used for ⅛″ than for ¾″ stone. Kilns are 6 to 8 ft. outside diam. and 100 to 125 ft. long. They are lined with fire brick, or with silica brick for the lower 20 ft. if sizes above 1 in. are to be burned. The former only last about 5 months at that part while the latter stand twice as long if set so as to permit expansion. The kiln is set at 4 to 5% slope and is rotated at ⅕ to 1 r. p. m. as required. Magnesian limestone burns faster and may be used in larger sizes or put through faster with less fuel. Gas or oil fuel is best. Powd. coal unless very low in ash contaminates the lime. Producer gas should be of uniformly high grade and well mixed by introducing it under preheated air from the cooler. The latter should be from 30 to 50 ft. long by 4 or 5 ft. in diam. Feeding of the stone from an elevated bin is automatic as the kiln runs. A dust chamber is located between the kiln and the stack. A waste-heat boiler with proper facilities for dust removal is desirable. Operating cost with an 8×125′ kiln, heated with producer gas, electrically driven and turning out 60 to 75 tons of lime each 24 hrs. for 300 days per year may vary from $3.45 to $8.47 per ton of lime made. The lower figure is based on 12 hr. shifts and 30c. per hr. wage, the higher on 8 hr. shifts and 50c. wage. Magnesian stone, coal at $5.00 per ton (4½ lbs. lime per lb. coal), power 1c. per kw.-hr. and $9.00 less per day for repairs and fixed charges are the basis of the lower cost figure. $90,000 to $100,000 plant investment is required. Rotary kiln lime burning needs further fuel-saving devices.
J. O. HANDY (*C. A.*)

102. Sound-proof partitions. F. R. WATSON. Univ. Ill. Eng. Expt. Sta., *Bull.*, **127**, 78 pp. (1922).—A compilation of available information on methods for insulating sound, with special reference to the needs of architects and builders.
H. L. OLIN (*C. A.*)

CERAMIC ABSTRACTS

Compiled by the

AMERICAN CERAMIC SOCIETY

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[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts* by coöperative agreement.

General and Miscellaneous

1. Silica gel. Ed. *Quarry & Surveyors' & Contractors' Jour.*, **27**, 44(1922).—The hydrous silicic acid known as silica gel has properties which may be useful in various industrial processes. Among these it has been proposed to use this subs. in the sulphuric acid industry for the purpose of abstracting small quantities of sulphur dioxide from gas mixts. containing as little as $^1/_2\%$ of SiO_2. This property of silica is due to what is called adsorption. The hydrated silica is dried, washed and partially dehydrated, producing a porous solid which possesses remarkable powers of adsorbing certain gases and is also capable of being metalized by platinum salts, whereby catalytic properties are acquired. There seems to be a distinct future for silica gel.

O. P. R. Ogilvie

2. The preservation of stone. Noel Heaton. *Quarry & Surveyors' & Contractors' Jour.*, **27**, 56–61(1922).—This article gives preventive and preservative treatments, summarizing as follows: (1) New work can be rendered to a certain extent more resistant to decay by treatment with fluorsilicates, provided the strength of soln. and method of application is adjusted to suit the stone used. (2) No preservative treatment will be effective on faulty- or face-bedded stones. (3) Constructional methods of reducing decay (prevention of damp, effective carrying away of storm water, etc.) are more important than preservative treatment. (4) For outside work on old buildings no preservative at present known serves to preserve decayed stone for more than a limited period. The most economical treatment is dressing with soft soap and alum, renewed every few years. (5) In interiors, where the stone has been corroded by sulphur compds. baryta treatment is, in many cases, beneficial, but it should only be used with restraint and under careful supervision, and should be followed by distempering. (6) Preservative treatment should only be employed where it is certain that it can, at the worst, do no harm. For this reason, articles of unknown compn. should be avoided, and only materials used, the action of which is well understood. Progress toward the goal can only be obtained by constant exchange of experience and study of results.

O. P. R. Ogilvie

3. A scientific method of quarrying slate. Ed. Delcourt. *Quarry & Surveyors' & Contractors' Jour.*, **27**, 52–55(1922).—Mr. Delcourt describes at length the system which has been adopted with very satisfactory results, but has never been applied and is very little known outside the quarries supervised by himself. These quarries are worked by the Société Industrielle des Pyrenées, Labassére, Dept. des Hautes Pyrenées. The method is based upon the use of wire saws for quarrying slate; and after more than two years' experience at the quarries in question, the technical and economic results have exceeded all expectations. Figures and diagrams are given. O. P. R. Ogilvie

4. X-ray tests for stone. Ed. *Quarry & Surveyors' & Contractors' Jour.*, **27**, 167(1922).—In Germany attention is being given to the examn. of building materials by means of X-rays. Twelve kinds of clay were examd. and various structures were observed in the X-ray diagrams, giving clear indications as to the uniformity and arrangement of the clay subs. The most conspicuous advantages of the X-ray method as compared with other testing processes are its cheapness and rapidity as well as the ease with which it can be used without any elaborate or difficult prepn., independently of any chem. analysis or the use of transparent microscopic sections, on large samples as well as on small amounts of material. Other kinds of building material showed interesting variations in permeability to X-rays, the following being arranged in the order of increasing transparency: Concrete mortar, granite, limestone, basalt, bricks, Horitz granite, Dutch bricks (clinkers), porphyry, gypsum, sandstone. In the case of concrete, a layer only 3 mm. thick of the concrete was found to afford excellent protection against X-rays. O. P. R. Ogilvie

5. Italian non-metallic industries. ANON. *Chem. Trade Jour. & Chem. Eng.*, **71**, 12(1922).—The Genoa correspondent for this jour. under title of "Notes on the Italian Chemical Industry" gives a résumé of Italy's imports for 1921, which show a very decided increase over 1920 for the non-metallic industries. O. P. R. OGILVIE

6. Industrial and structural minerals. ANON. *Min. & Eng. Record*, **26**, 253–254 (1922).—A comprehensive survey of the growth in production during this year is given in this article. A special rotary furnace, invented and patented by Messrs. Thompson and Oliver has been used in the treating of magnesite at the Pacific Roofing Co.'s plant on Industrial Island and has done excellent work. Lime, silica, feldspar and talc are among the other minerals reviewed. Reference is also made to all the well-known producers of brick and refractories, cement, gypsum, sand and gravel with details of progress. O. P. R. OGILVIE

7. Cold production of water resistant material. ANON. *Keram. Rundschau*, **30**, 280(1922).—The compn. is as follows: 375 parts flint, 51 parts limestone, 8 parts calcined clay, 3 parts calcined feldspar and 28 parts water glass. The first four ingredients are mixed dry and then the water glass is added after which it is immediately pressed and dried. H. G. S.

8. Informational needs in science and technology. CHAS. L. REESE. *J. Ind. Eng. Chem.*, **14**, 364–8(1922).—The great need and value of coördinated, available information are discussed with a broad point of view and the efforts and plans of the Natl. Research Council in its Research Information Service towards the fulfillment of this need are described. E. J. C. (*C. A.*)

9. The factor of safety in research. A. F. SHULL. *Science*, **55**, 497–505(1922).—An address. E. J. C. (*C. A.*)

10. Electroösmosis. PAUL BARY. *Chimie et industrie*, **7**, 640–50(1922).—A review, with bibliography, of the applications of electroösmosis to industrial processes. Also in *Chem. Trade J.*, **70**, 625–7(1922). A. P.-C. (*C. A.*)

11. A comparison between stationary and mechanical producers. A. L. CULBERTSON. *Nat. Glass Budget*, **38**, No. 3, 22–6(1922).—A detailed account of the Chapman floating agitator. The m. p. of the ash of gas coals is usually within the limits 1900–2600°F. Corresponding to these temps. the blast temp. necessary to prevent clinkering in the producer varies from 148° to 108°F. J. B. PATCH (*C. A.*)

12. The pulverization of fuels. A. B. HELBIG. *Feuerungstechnik*, **10**, 114–9, 140–3(1922).—After giving the principles controlling the powdering of fuel, H. classifies the different kinds of machinery used for the purpose and describes and illustrates a typical machine of each kind. ERNEST W. THIELE (*C. A.*)

13. Improved low-temperature by-product recovery gas-producer process. POWER GAS CORPORATION. *Iron Coal Trades Rev.*, **104**, 576(1922).—The Mond gas-producer has been modified so as to combine the principle of low-temp. carbonization with the original Mond gas process. The process is one of complete gasification in which the volatile matter of the coal is converted into liquid products according to low-temp. methods, and the residual fuel entirely converted into producer gas. The transmission of heat to the raw coal is achieved in a gradual but effective and rapid manner by the use of the sensible heat contained in the hot producer gas evolved in the lower part of the producer without the intervention of retort walls. There are produced per ton of fuel about 115,000–120,000 cu. ft. of producer gas of 178 B. t. u. analyzing CO_2 8.3, CO 21.0, H_2 20.5, CH_4 4.9, N_2 45.3%, 15 to 24 gal. of low-temp. tars, and 90 lbs. of $(NH_4)_2SO_4$. The steam required in the process is about 1 lb. per lb. of coal gasified, the whole of which is decomposed. Air and steam superheaters are not required. Installation and maintenance costs are lower than for the original type of plant. J. L. W. (*C. A.*)

14. Instruction of students in the use of technical literature; an unexploited phase of engineering education. E. H. McClelland. *Eng. Education*, **12**, 407–20(1922). E. J. C. (*C. A.*)

15. Relation of employer and employee as regards ownership of patents. Maurice Block. *Chem. Age* (N. Y.), **30**, 201–2(1922). E. J. C. (*C. A.*)

16. Current chemical patents and patent problems. Lloyd Van Doren. *Chem. Age* (N. Y.), **30**, 235–8(1922); cf. *C. A.* **16**, 1822. E. J. C. (*C. A.*)

17. Influence of patent law on the evolution of research. H. E. Potts. *Chem. Age* (London), **6**, 726–7(1922). E. J. C. (*C. A.*)

BOOKS

18. Jahr- und Adressbuch der Bau- und keramischen industrie. (Industrie der Steine und Erden, Glas und Porzellan.) 1920–1. Edited by R. Hanel. Vienna: Compassverlag. 328 pp. M 32. Reviewed in *Tonind. Z.*, **46**, 481(1922). (*C. A.*)

19. Taschenbuch für Keramiker. Berlin: Verlag Keramische Rundschau, G. m. b. H. 206 pp. Reviewed in *Z. angew. Chem.*, **35**, 211(1922). (*C. A.*)

PATENTS

20. Gas producer. H. G. Johnston. U. S. 1,412,118, Apr. 11. (*C. A.*)

21. Gas producer. W. B. Chapman. U. S. 1,412,921, Apr. 18. (*C. A.*)

22. Gas producer. F. M. E. Blass. U. S. 1,414,109, Apr. 25. (*C. A.*)

23. Device for selective absorption from gas in transmission lines. F. F. Uehling. U. S. 1,412,790, Apr. 11. (*C. A.*)

Apparatus and Instruments

24. The construction of electric steel furnaces. M. Guédras. *Technique moderne*, **13**, 497–501(1921).—A discussion of the construction of elec. steel furnaces and of the importance of interposing non-magnetic parts in the shell thereby preventing the presence of a closed magnetic circuit and elimination of induction at Foucault's currents, and of the necessity of adopting a spherical formula to obtain as complete a utilization of the energy as possible. A. P.-C. (*C. A.*)

25. Wood-Harry cleaner and concentrator. Anon. *Chem. Eng. Mining Rev.*, **14**, 142–3(1922).—A new type of concentrator for cleaning floated sulfide or other ores from gang and also for the primary flotation of sulfide ores has been developed at Mt. Lyell. The app. may also be used for cleaning fine coal or graphite. The concentrator consists of a series of atomizing wheels set in cells below the bottom of the box of the machine and driven at variable speeds by high-pressure water jets. Air is led into the cells so as to impinge on the blades of the wheels. Air bubbles generated by the wheels join those already in the primary froth or feed to the machine and so change the nature of the froth that it no longer holds the gang in suspension. Louis Jordan (*C. A.*)

26. Air bubble viscosimeter. V. R. Abrams, J. T. Kavanagh and Chas. H. Osmond. *Chem. Met. Eng.*, **25**, 665–6(1921).—A glass tube, 21 cm. long and from 5.2 to 5.3 mm. in internal diam., with 2 lines etched on it 10 cm. apart near the middle of the tube, is sealed off at one end. The tube is filled with oil and closed with a tight-fitting glass cap which encloses a vol. of air which will fill 1.7 cm. of the tube when inverted. The time required for the bubble to pass between the 2 marks is proportional to the viscosity in Saybolt seconds and the "factor" may be obtained by calibration with a sample of known viscosity. Variations should not be over 1% for oils having a viscosity between 80 and 475 sec. Saybolt. The use of diams. other than those given or of an unrestrained bubble is impracticable and, therefore, water can not be used for calibration. The caution is given that when oils are re-run repeatedly, the viscosity may change considerably. Eugene C. Bingham (*C. A.*)

27. A microscopic arrangement for the examination of opaque crystals. M. FRANÇOIS AND CH. LORMAND. *Bull. soc. chim.*, **29**, 366–74(1921).—No contrivance has previously been devized for rendering visible microscopically very small opaque or deeply colored crystals in all their details without deformation, halo or false colors. Various methods led to the development of 2. Lateral illumination by an incandescent Pt wire permitted perfect vision with objectives 7 and 8 but was discarded because of frequent fusion of Pt and heating of both the crystals and the objective. The method adopted consists of (1) an ordinary microscope with its objectives fitted on their lower face with a Ag concave mirror pierced by a hole; (2) an incandescent light placed in the microscopic axis with its rays rendered parallel to the axis by a lens; and (3) a glass slide with an opaque disk on which rest the crystals protected from the light passing from beneath. The curvature of the mirror must be such that the reflected light converges on the object, and consequently each objective must have its own mirror. The width of the mirror should be equal to or less than its radius of curvature. The opaque disks are made of various colors depending on the crystals, and vary from 0.75 to 3.0 mm. in order to cover the field of any size of objective. The source of illumination can be a 2–3 v. lamp, 1–2 cm. diam. set in an eye-piece so that the lens renders the rays parallel. Directions are given for the mech. construction of the complete contrivance. Crystals of Fe, Cr and Ni silicides, Hg_2NI, $Hg_7H_2NI_4$, HgS, etc., have been photographed by this method with remarkable results. C. C. DAVIS (*C. A.*)

Chemistry, Physics and Geology

28. Measuring kiln gases. ANON. *Brick Pottery Tr. Jour.*, **30**, 132(1922).—The meas. of the vol. of gases passing through the flues of a kiln or up a chimney is by no means an easy task, as these gases are charged with both moisture and dust, and can not be passed through a "pitot" tube. For many reasons sufficiently accurate results may be obtained by inserting a damper having a sharp orifice at its center, this orifice being 1″ or more in diam., according to the size of the flue. When the gas passes through such an orifice the vel. is greatly increased, some of the original pressure being converted into vel. pressure, while the static pressure of the gas which has passed through the orifice is lower than the original static pressure. The quantity (Q) of gas flowing through the pipe in cu. ft. per sec., is found by the following equation:

$$Q = 403 \frac{CATh}{PD}$$

C is the coef. of flow (usually about 0.95–0.99), A is the area of the orifice, h the differential pressure (in in. of water) of the gas on each side of the orifice, P is the absolute pressure of the gas in in. of mercury, T is the absolute temp. in degrees C and D is the density of the gases referred to air at the same temp. There are difficulties connected with the meas. of the temp. and pressure of the gas, but when these are overcome the method is fairly accurate. H. G. SCHURECHT

29. Immense deposits of magnesite in southern Nevada. ANON. *Clayworker*, **78**, 29(1922).—A massive deposit of magnesite of unusual character has been found by the U. S. Geol. Surv. in Clark Co., Nev., in the valley of Muddy River a few miles from St. Thomas. This material has for some time been mistaken for kaolin but it was recently found to be a highly magnesian sedimentary bed. The material is porcelain white, fine-grained and massive, is remarkably free from foreign material, and has a structureless appearance and a conchoidal fracture. It is not as hard as typical magnesite. In places the deposit is 200 ft. thick. H. G. SCHURECHT

30. Colloidal clay production. ST. AUSTEL. *Quarry & Surveyors' & Contractors' Jour.*, **27**, 228(1922).—The possibilities of colloidal clay production continues to be

discussed as a means of extending the demand of china clay for new uses, but as yet the work is in the experimental stage. Colloidal clay results from the subjection of ordinary china clay to chemical treatment carried on in specially constructed tanks, between the washing and drying processes now applicable to ordinary china clay production. Colloidal clay may be said to be the essence of china clay, all impurities and deleterious matter having been eliminated or neutralized by the chemical treatment. It is claimed that the value of the clay thus purified is enhanced by pounds per ton at comparatively small cost. O. P. R. OGILVIE

31. Mineral resources of Jugoslavia. ANON. *Nature*, **110**, 34(1922).—This issue of *Nature*, in reviewing the report, "Geology and Mineral Resources of the Serb-Croat-Slovene State," states "Among the other minerals that have been or are being worked may be named bauxite, meerschaum and rock salt." O. P. R. OGILVIE

32. Mica in India. ANON. *Imp. Inst. Bull.*, **19**(1921).—In J. C. Brown's "Notes on Mica" (Bulletin, Indian Ind. & Lab., No. 15, 1921) he gives much information as to the industrial uses of mica, its specifications and standards, and brief notes on characteristics of the mineral and its production in India. Methods of trimming, grading, sizing, and splitting mica are described, as well as mica preparations, substitutes, prices and sources of supply, concluding with a summary of the outlook for Indian mica. O. P. R. OGILVIE

33. Some simplified formulas for excess air. JOHANN AGTHE. *Feuerungstechnik*, **10**, 113–4(1922).—Refers to the combustion of gases only.
ERNEST W. THIELE (*C. A.*)

34. Kaolin and kaolinized granite in the district between Strobel and Saarau, Silesia, and their formation. L. VON ZUR MÜHLEN. *Z. prakt. Geol.*, **1921**, 56–61.—Descriptions of several deposits are given, with analyses. The kaolin passes gradually into unaltered granite, and was formed by the action on the granite of the waters of Tertiary swamps, whose place is now occupied by lignite which was deposited in them.
E. F. H. (*C. A.*)

35. The volumetric determination of titanium dioxide in bauxite. H. J. WINCH AND V. L. CHAND-RATREYA. *Chem. News*, **124**, 231–2(1922).—Fuse 0.3 g. of the sample with 3 g. $KHSO_4$, dissolve the melt in hot dil. HCl and reduce the Fe^{+++} to Fe^{++} and the Ti^{++++} to Ti^{+++} by treatment with 0.15 g. of powdered Sn. Add an excess of $HgCl_2$ to remove the excess Sn and titrate Fe + Ti with standard $K_2Cr_2O_7$ soln. With another sample carry out the same procedure but in place of metallic Sn use $SnCl_2$ soln. as reducer, stopping as soon as the yellow $FeCl_3$ is reduced, thus detg. Fe alone.
W. T. H. (*C. A.*)

36. An apparatus for the rapid measurement of surface tension. R. G. GREEN. *J. Bact.*, **7**, 367–70(1922).—An app. called the surface tension balance is described for the rapid measurement of surface tension by the drop-weight method. It consists of a dropping pipet, a delicate torsion balance, and an adjustable scale upon which the surface tension is read directly in dynes per cm. JOHN T. MYERS (*C. A.*)

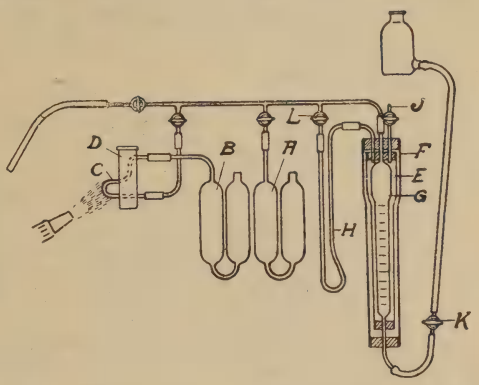
37. New stalagmometer or guttameter. F. ESCHBAUM. *Ber. pharm. Ges.*, **31**, 211–9(1921).—In estimating the surface tension of liquids by the drop method, the rate of outflow must not exceed 14 to 16 drops per min., a condition usually attained by providing the instrument with a sufficient length of capillary tubing. The same result is more readily secured by the following device. The upper end of the stalagmometer or guttameter consists of a glass stopcock having an opening on one side, the barrel of which has grooves running parallel to its length and communicating with each other at both top and bottom. A portion of the surface remains smooth so that the stopcock may be completely closed. On turning the barrel, the air in passing to the top of the liquid can be directed through any desired length of capillary, thus regulating the

outflow of liquid accurately. The paper includes tables for calcg. guttameter estns. to stalagmometer measurements, and for normalizing any guttameter readings. In corrections for temp., every increase of 1° in the atm. temp. the drop wt. (guttameter) decreases by 0.25%, while the drop number (stalagmometer) increases by 0.25%.
W. O. E. (*C. A.*)

38. The origin of gumbotil. G. F. Kay and J. N. Pearce. *J. Geol.*, **28**, 89–125 (1920).—The aim of this paper has been to show by field and lab. evidence that the gumbotils on Nebraskan, Kansan, and Illinoisan glacial tills are the results of chem. weathering of the drift and furnish good criteria for differentiating the older drifts. It is recognized that wind action, freezing and thawing, burrowing of animals and slope wash have also contributed to their formation. W. F. Hunt (*C. A.*)

39. Some colloidal properties of Pleistocene clays and their bearing on the chemical theory of the formation of gumbotil. J. N. Pearce and L. B. Miller. *J. Phys. Chem.*, **26**, 1–24(1922).—The authors discuss the geological and chem. evidence in support of the theory of Kay and Pearce (preceding abstract). This assumes that, following the laying down of each original drift, a long period elapsed during which chem. weathering and leaching took place; that the upper layers are the residual left by those processes. After a time diastrophic movements occurred, and erosion then developed the topography existing at the ends of the interglacial periods. L. W. Riggs (*C. A.*)

40. Modified Orsat apparatus for flue-gas analysis. O. I. Hansen. *Ingeniören*, **30**, 467–8(1921); *Chimie et industrie*, **7**, 494–5(1922).—In the course of flue-gas analyses H. found that most of the errors of the Orsat app. are due to temp. variations caused by the construction of the app. In the modified app. devized by him, the graduated buret *G* is surrounded by an air jacket *E* (contg. a little distd. water in the bottom), surrounded in turn by a water jacket *F*. *E* is connected with the manometer tube *H*; *J* is a tap which is used to equalize the pressure in *E* (to avoid having too great a correction for temp. and barometric pressure) and which remains closed during the analysis. The shape of the jackets *E* and *F* is similar to that of *G* instead of having a uniform diam. as in the regular Orsat.



A. P.-C. (*C. A.*)

41. Practical interpretation of automatically recorded volumetric percentages of carbon dioxide in flue gases. W. E. Appleby. *Chem. Eng. Mining Rev.*, **14**, 156–60 (1922).—A flue-gas delator (alinement chart) is developed and illustrated. By the alinement of the values representing the vol. of CO_2 in the flue gas as read from an automatic CO_2 recorder and the difference in temp. between the atmosphere and the exit gas, the heat value wasted is read directly. Louis Jordan (*C. A.*)

42. New conceptions of electrolytes. I. The degree of dissociation of acetic acid in water and in salt solutions. Erling Schreiner. *Z. anorg. allgem. Chem.*, **115**, 181–202(1921).—A theoretical paper in which formulas are derived for correcting the dissoc. const., as ordinarily detd. from cond. measurements, for the viscosity of the soln., inter-ionic force, and the activity of the water, that is, the hydration of the H-ion. The cond. of AcOH as detd. by different observers is thus corrected at 25° over the

range of diln. from 0.0005 to 2.6 normal. The law of mass action is shown to hold up to the highest concn. From potential measurements at 18° and 25° of AcOH solns. contg. NaOAc or other salts, the activity of the acetate ion and the dissoc. const. of AcOH have been calcd. Such measurements do not, as has been generally supposed, det. the H-ion concn., but the activity of the H-ions, which is associated only with the non-hydrated ions. The dissoc. consts. of AcOH calcd. thus agree well with those calcd. from the cond. measurements. Taking the activity const. of the H-ion as 0.2, that of the acetate ion is the same in NaOAc soln. and 0.3 in Na and K chloride solns. **II. The introduction of a catalysis coefficient in hydrogen-ion catalysis.** *Ibid.*, **116,** 102–16.—In catalytic reactions such as the hydrolysis of esters or the inversion of sucrose by acids, assuming complete dissoc. and that only the H-ions are active, the reaction velocity should be proportional to the concn. Actually, however, the catalytic effect at higher concns. is greater, and a similar accelerating effect is produced by the addition of neutral salts. It is shown that, by the introduction of a catalysis coeff., f_k, this extra catalytic effect can be accounted for. The new coeff. is found to be the reciprocal of the cond.-viscosity coeff., f_μ, which is the ordinary cond. coeff. corrected for the viscosity of the electrolyte. The ratio v/C, where v is the reaction velocity and C the acid concn., thus corrected to vf_μ/C, gives a very good const. in the hydrolysis of acetates by HCl alone and in presence of neutral salts, in the inversion of sucrose, and in the keto ⟶ enol acetone transformation. The degree of dissoc. of weaker acids, such as dichloracetic or cyanoacetic acid, can be calcd. from catalysis measurements, and the results agree very closely with those calcd. from cond. measurements. J. C. S. (*C. A.*)

43. Notes on white chlorites. E. V. Shannon and E. T. Wherry. *J. Wash. Acad. Sci.*, **12,** 239–41(1922).—New analyses of white chlorites, called colerainite, sheridanite, etc., gave:

	1	2	3
SiO_2	28.10	36.70	27.78
Al_2O_3	26.20	10.38	24.30
Fe_2O_3	1.66	1.22	0.35
FeO	none	trace	1.43
CaO	trace	0.86	trace
MnO	trace	trace	none
MgO	30.36	36.44	32.71
H_2O+	14.00	13.80	13.01
H_2O-	0.56	1.06	0.06
sum	100.88	100.46	99.64
α	1.562	1.555	1.576
β	1.562	1.560	1.576
γ	1.576	1.560	1.589
2E	0°	30°	small
sign	+	—	+

1. Brinton's Quarry, Pa. 2. Nottingham, Pa. 3. Wyoming. White chlorite from Sylmar, Pa., showed the forms: 001, 010, 110, 112, 011, 043, 111, 132, 101, 134. The Pa. chlorites were formed by the action of Mg-bearing waters on albite-pegmatite.

Edw. F. Holden (*C. A.*)

44. The mechanism of the dehydration of crystalline aluminium hydroxide and of the adsorption of water by the resulting alumina. L. H. Milligan. *J. Phys. Chem.*, **26,** 247–55(1922).—Cryst. $Al(OH)_3$ prepd. by the Bayer process does not lose wt. below 145° at atm. pressure. Above this temp. decompn. sets in with loss of water until at 200° the trihydrate is completely decomposed. The porous Al_2O_3 still retains 8% water which is given up slowly as the temp. is increased, indicating that it is held by adsorption.

Intermediate hydrates between $Al(OH)_3$ and Al_2O_3 do not exist. On rehydrating the ignited Al_2O_3 in moist air at room temp. it takes up water, the amt. taken up being greater the lower the temp. of ignition. The curves obtained on drying these samples show that the cryst. $Al(OH)_3$ is not formed again, but the water taken up is adsorbed. X-ray examn. (by Hull's method) of the materials shows that the cryst. $Al(OH)_3$ is identical with the mineral gibbsite, and that the ignited Al_2O_3 has an entirely diff. structure. The X-ray pattern of the Al_2O_3 does not change as it adsorbs water.

F. L. Browne (*C. A.*)

45. A centrifugal method for preparing colloidal ferric hydroxide, aluminium hydroxide, and silicic acid. Richard Bradfield. *J. Am. Chem. Soc.*, **44**, 965–74 (1922).—Hydrosols of hydrous Fe_2O_3, Al_2O_3, and SiO_2 of unusually high purity can be prepd. by pptg. the oxides by addn. of NH_4OH to the corresponding chlorides or HCl to Na silicate, resp., and very thoroughly washing the ppts. by decantation until they begin to become colloidal. They are then suspended in water and passed through a Sharples Supercentrifuge operating at 32,500 r.p.m. The deposit is repeatedly suspended in water and centrifuged. The lower half of the contents of the bowl is then stirred up in water, giving a hydrosol, Sol A, the upper half similarly giving Sol B. The liquid discharged from the centrifuge on the fourth and subsequent washings is Sol C. Analysis of one of the Fe_2O_3 sols showed 396 g. equiv. Fe_2O_3 per g. equiv. Cl. The SiO_2 sols are free from Cl^-. The sols are very stable; even Sol A, which contains the largest particles, gave no sepn. on 20 min. centrifuging at 2000 r.p.m. On boiling the sols may be reduced almost to sirupy consistency without coagulating. When $Al_2(SO_4)_3$ is pptd. by NH_4OH the ppt. can be peptized by this method, showing that SO_4^{--} does not ppt. the sol irreversibly as heretofore supposed. SiO_2 sol free from electrolytes has $p_H = 6.5$

F. L. Browne (*C. A.*)

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46. Treating clay. W. Feldenheimer and W. W. Plowman. Brit. 175,050, Nov. 8, 1920. Clay is deflocculated with the aid of an alkali resinate or its equiv., such as a soln. of a resin acid in one or more alkalies, the preferred reagent being a soln. of common resin in caustic alkali, alkali silicate, or alkali carbonate, or a mixt. of caustic alkali and alkali silicate. The reagent may be applied before or after passing the suspension over mica drags, and also for the deflocculation of an already purified clay. Subsequent pptn. of the clay from the suspension may be effected as described in 121,191. (Cf. *Jour. Amer. Ceram. Soc.*, **4**, 495(1921).) (*C. A.*)

47. Zinc oxide. A. Pearson. Brit. 176,588, Jan. 17, 1921. Crude ZnO contg. colored oxides of Cd and Pb is mixed with a small quantity of $ZnSO_4$ or H_2SO_4, and calcined in a muffle at a temp. not exceeding 878°, preferably 720–820°, so as to convert the Cd and Pb into white compds. The $ZnSO_4$ added should be finely divided. (*C. A.*)

Refractories and Furnaces

48. Research is tool which will improve refractories. W. A. Hull. *Brick Clay Record*, **60**, 544–5(1922).—H. states that user and consumer should know refractories; that tridymite improves silica brick; that furnace designs should be given more attention; that chrome Fe ore is a good refractory; and that special refractory oxides and silcates should be investigated. H. G. Schurecht

49. Electric furnace iron and steel. Intermittent and alternating operations. W. E. Cahill. *Trans. Am. Electrochem. Soc.*, **41**, preprint, April (1922); *Iron Age*, **109**, 1277–8(1922).—Elec. furnace Fe castings have been made at Treadwell, Alaska, since 1918, where it has been found cheaper than possible with a cupola. The av. power consumption for 25 consecutive heats of iron and steel with 2-voltage control shows

a saving of 75 kw.-hr. per ton of Fe and 42 kw.-hr. per ton of steel. Cast iron was made with 784 kw.-hr. per ton, and steel with 893 kw.-hr. per ton. Intermittent operation is most severe on electrodes and roof. A good spout is of prime importance so that the furnace will drain. Cast gray iron of a uniformly fine-grained structure and low S, free from occluded gases is obtained. The removal of S depends upon the length of time the metal is held under a carbide slag. W. E. RUDER (*C. A.*)

50. Operation of the electric blast furnace. SEIGLE. *Rev. metal.*, **19**, 86–9(1922).—A discussion of the effect of rapid changes in temp. upon the compn. of the gas in the mouth of the furnace and the quality of the melt due to the resulting equil. between coke and ore, with special reference to the method of charging and the descent of material in the furnace. W. A. MUDGE (*C. A.*)

51. Cost of heat-treated parts reduced to a minimum by electric furnace. C. L. IPSEN. *Elec. World*, **79**, 1125–6(1922).—Detailed cost figures and comparative figures for oil furnace are given. C. G. F. (*C. A.*)

52. An adaptable electric steel company. S. G. KOON. *Iron Age*, **109**, 1196–1202 (1922).—A description of the melting, heat-treating and forging equipment of the Sizer Steel Co.'s plants at Buffalo and Syracuse. Two 12-ton Heroult furnaces, each making 4 heats per day, receive power from Niagara. All other heating is done with pulverized coal. Crank shafts, connecting rods, die blocks, stern and rudder frames, balls, rod and bars are produced. Illus. of equipment and layout are given. W. E. R. (*C. A.*)

53. Electric tool steel melting practice. W. J. GREEN AND S. S. GREEN. *Iron Age*, **109**, 999–1001(1922); cf. *C. A.* **16**, 23, 686.—The major aspects of (*a*) acid *vs.* basic bottom, (*b*) liquid *vs.* cold charge, and (*c*) double *vs.* single voltage are discussed. The basic bottom is preferred, not on account of refining the charge, but because of its ability to carry a strongly reducing slag, atm. and general melting practice. Cold charges are preferred, as open-hearth metal, impoverished by its melting conditions, can not be fully rejuvenated by ordinary elec. furnace methods. Crucible quality may only be obtained by melting high-grade cold charges. Double voltage of 115–125 high to 75–85 low is satisfactory. Higher voltages are at present satisfactory only for medium or cheaper products. A single voltage of 95 is a satisfactory all-round pressure, in life of refractory, output and quality of product. W. E. RUDER (*C. A.*)

54. The Fiat electric furnace. ANON. *Engineering*, **113**, 421–2(1922).—About 50 Italian firms now have elec. furnace equipment. There are about 100 small furnaces of about 1 ton which work only a few mos. during the year. In northern Italy there are now 22 15-ton Heroult furnaces and 10 of 5–8 ton capacity. The Fiat furnace has been in constant operation for the last 5 yrs. There are now four 20-ton and 12 smaller (3–6 ton) furnaces in operation at the Fiat plants. The furnace is cylindrical in shape, 3-phase type, with the hearth slightly conductive and connected to ground. A characteristic feature is the "economizer" or electrode holder which completely encloses the furnace roof. This is a water-cooled cylinder, fitted with insulating rings to guide the electrode, and prevents their wasting. The design provides for ease of access for maintenance. The sides of the electrodes remain parallel and carry greater current down inside the furnace, thus reducing the working time. The electrode consumption is 6.3 lb. per ton of steel. The av. power required is 650 kw. hrs. per ton. Roof and linings last about 150 heats, and clamps have not needed renewal in 5 years. It has been possible to reach 9 heats per 24 hrs. starting from a cold charge.
W. E. RUDER (*C. A.*)

55. Electric furnace melting. H. NEEDHAM. *Chem. Met. Eng.*, **26**, 871(1922).—The selection of the correct elec. system is the secret of the com. success of an elec. furnace. The elec. furnace depends not upon any cleansing action so much as upon the

absence of contaminating impurities. Modern furnaces are fitted with tight doors, electrode economizers and flame muffling devices, which makes them very highly efficient. The use of small or large amts. of Al is purely a question of skilled metallurgy.

W. E. R. (*C. A.*)

56. Melts aluminium in electric furnace. H. E. DILLER. *Foundry*, **50**, 345–51 (1922).—A description of an elec. installation and a comparison of results with crucible and elec. furnaces. The furnace consists of a large steel shell on trunnions and swung by a hand wheel. The body and cover are lined with insulating material and fire-clay brick. Two electrodes are connected with resistance formed of small particles of C held in a carborundum trough, which extends completely around the furnace at the height indicated by the electrodes. The heat is reflected to the roof and down upon the metal. The metal is charged through a door in the rear and is rabbled during the melting operation through a rear door. The bath is fluxed with cryolite. The hand ladles used are preheated. It requires 728 kw. to melt 1 ton (909 kg.); this high figure is due to the heat of fusion of Al. The principal expense in the crucible process lies in the crucibles and in the elec. furnace. The expense is due to high installation and current costs. The latter costs are not increasing as rapidly as fuel costs and melt losses are about $^1/_4$ those of the crucible process. Other advantages of the elec. furnace include: absence of fume and smoke, little lining repair, lower heat radiation and better working conditions. *Heats of fusion* in B. t. u. are given as: Al, 139; Zn, 58; Sn, 25.

W. H. BOYNTON (*C. A.*)

57. The melting of cast iron in the Booth rotating electric furnace. H. M. WILLIAMS AND T. B. TERRY. *Trans. Am. Electrochem. Soc.*, **41**, preprint, Apr. (1922).—Results of research with a small (250 lb.) elec. furnace are described. 750 heats have been made, and the furnace is now making 15 heats per week. Satisfactory castings have been made from boiler-plate, ferro-silicon and C; malleable from borings and steel; and iron alloys of various kinds. Refining by slagging is not possible with this type of furnace.

W. E. RUDER (*C. A.*)

58. Electric furnace melting. W. H. KEEN. *Chem. Met. Eng.*, **26**, 869–70(1922).—Elec. furnace processes should be compared with the open-hearth and not the crucible process, though the product may resemble that of the latter. For this reason an open-hearth melter is usually better adapted to elec. furnace operation than a crucible melter. It is quite possible to make high-grade steel from poor scrap in the elec. furnace, but it is usually not advisable from a cost viewpoint. Al should not be used to correct improper working, but a little should be added, to insure complete deoxidation.

W. E. RUDER (*C. A.*)

59. An explanatory note on heat insulating materials. MAX JAKOB. *Arch. Warmewirtschaft*, **3**, 23–6(1922).—An explanatory discussion of an article by Hencky and Cammerer, *Mitt. Forschungsheim für Warmeschutz*, Nos. 1 and 2. Contrary to H. and C. the only comparable method of expressing value of an insulating material is its heat transmission coeff. Tables are given showing that the fall in temp. or the total amt. of heat lost per hour depends on so many variables that they can not be used as a comparison of insulating materials. The paper contains a number of references to articles on heat-insulating materials.

W. L. BADGER (*C. A.*)

60. (Blast furnace) lining failures caused by zinc. P. O. MENKE. *Iron Trade Rev.*, **70**, 1409–10(1922); cf. *Ceram. Abs.*, **1**, 181(1922).—Investigations of several disintegrated blast furnace linings showed the presence of varying amts. from 0.1 to 40% of ZnO absorbed in the body of the brick. It is often present in the ores and limestones from certain regions. It is assumed that it had combined with the alumina in the brick. Its effect, which is accumulative, is to expand and break up the bond. Water-cooling above the mantle seems to accelerate the action. By using a heavy shell, if

necessary above 1-in. thick, and removing the water-cooling above the mantle, the trouble can be reduced to a min. J. L. WILEY (*C. A.*)

61. Cast iron as produced in the electric furnace and some of its problems. G. K. ELLIOTT. *Trans. Am. Electrochem. Soc.*, **41**, preprint (1922); *Iron Age*, **109**, 1225–6. —The history of the development of the elec. furnace for the prepn. of cast Fe is outlined. The refining on a basic bottom of cupola-melted metal is the field of widest possibilities for the elec. furnace for cast Fe. Ability to refine in addition to melting and increased power to superheat are 2 desirable characteristics lacking in the cupola but outstanding in the elec. furnace. Elimination of S is the most striking reaction in the basic elec. furnace. Anomalous results have been reported as to the effects of S on irons. Low S may be simply an indication that the iron has passed through a strong refining treatment and better quality in such a case may be due to elimination of little known impurities, as O or N. One of the moot questions of cast Fe is whether or not Fe oxide can exist in molten cast Fe in the presence of the usual amt. of C, Si, and Mn and, if it is present, whether its influence is harmful or beneficial. The question of O in cast Fe, as well as that of N and other gaseous elements, must remain unsettled until satisfactory analytical methods are available. The superheating possible in the elec. furnace is of advantage in producing fluidity with any compn. of Fe. There is evidence that elimination of CO and CO_2 in cast Fe has a retarding effect on the pptn. of graphite. This factor may contribute to the increased strength and soundness of elec.-furnace cast Fe. LOUIS JORDAN (*C. A.*)

62. Chromite in 1921. EDWARD SAMPSON. U. S. Geol. Survey, *Mineral Resources of U. S., 1921*, Pt. I, 15–17 (Preprint No. 3, publ. May 15, 1922). E. J. C. (*C. A.*)

63. Recovery of radiated heat from a rotary kiln or drier. ANON. *Chem. Met. Eng.*, **26**, 846(1922).—The kiln is to be surrounded by an insulated housing. Air is to be drawn through the annular space and thus preheated before being used in firing the kiln. The radiation from an uncovered kiln may be as high as 1000 B. t. u. per sq. ft. per hr. Insulation within the kiln is not practical because of the high temp. of the refractories which would result. W. L. BADGER (*C. A.*)

64. Electromagnetic motions in electric furnaces. CARL HERRING. *Trans. Am. Electrochem. Soc.*, **41**, preprint (1922); cf. *C. A.*, **15**, 1857; *J. Franklin Inst.*, **192**, 599(1921).—It is the purpose of the present paper to show how the new law proposed in the former paper may be applied in practice to the production of possible forces for performing desired useful operations, like circulating, stirring, transferring, etc., in elec. furnaces. Guides are given to aid in detg. whether such motions can probably be produced by the current. The former restrictions to only one such motion-producing force were not justified, and many others formerly not accepted are possible. D. MACRAE (*C. A.*)

PATENTS

65. Refractory compositions. BUFFALO REFRACTORY CORPORATION. Brit. 176,436, Nov. 2, 1920. A refractory compn. comprizes Si carbide, flake or cryst. graphite, a flux, and a carbonizing binder, such as tar or molasses. As fluxes, clay, salts, such as borax, metallic or non-metallic oxides, or sulfides may be used. The mixt. is molded in the usual manner and baked at about 1000°. Suitable proportions of the ingredients are 68 pts. of Si carbide, 25 pts. of graphite, and 7 pts. of flux, or of flux and binder. The compn. is suitable for making heat-resisting articles such as crucibles, fire bricks, retorts, muffles, furnace cores, tubes, combustion boats, pyrometer tubes, furnace linings, and heat-resisting cements. (*C. A.*)

66. Refractory compositions. BUFFALO REFRACTORY CORPORATION. Brit. 176,437, Nov. 2, 1920. A refractory compn. for making heat-resisting articles, such as

crucibles, comprises a refractory elec.-furnace product such as fused alumina or silica, flake or cryst. graphite, a flux, and a carbonizing binder such as tar or molasses. As fluxes, clay, salts such as borax, metallic or non-metallic oxides, or sulfides may be used. The mixt. is molded in the usual manner and baked at about 1000°. Suitable proportions of the ingredients are 60 pts. of the elec.-furnace product, 20 pts. of graphite, 12 pts. of binder, and 8 pts. of flux. Cf. preceding pat. (*C. A.*)

67. Preserving electric-furnace linings. H. C. SICARD. U. S. 1,416,584, May 16. A lining contg. Ti oxide is used in smelting mixts. contg. Ti ores and other ores such as Fe oxide or Fe and C. (*C. A.*)

68. Refractory composition. H. H. BUCKMAN and G. A. PRITCHARD. U. S. 1,412,916, Apr. 18. A material adapted for making retorts, muffles or crucibles is formed of zircon and a refractory clay. Cf. *Ceram. Abs.*, **1**, 68(1922). (*C. A.*)

Abrasives

69. Abrasives. ANON. *Min. & Eng. Record*, **26**, 253(1922).—This year abrasives have been produced in B. C. for the first time. A shipment of quartz has been made from the Drum Lummon Mine to Victoria to be used in the manufacture of sand paper. O. P. R. OGILVIE

70. Garnet. RAYMOND B. LADOO. U. S. Bur. of Mines, *Repts. of Investigations*, No. **2347**, 16 pp.(1922).—This paper gives a general description of garnets, their geological occurrence, localities (N. Y., N. H., N. C., Conn., Pa., Ga., Va., Spain, Labrador), statistics as to production (from 1910–18, U. S. production was four to six thousand tons/yr., the value increased from 113 to 248 thousand dollars, N. Y. being the largest producer), methods of mining and milling tests, uses (abrasives) and a bibliography. EDW. F. HOLDEN (*C. A.*)

PATENTS

71. Metallic carbides. S. GOLDSTEIN. Brit. 175,638, Feb. 16, 1922. Artificial stones for making drilling and turning tools and wire-drawing dies are produced by mixing powd. W, Mo, or like difficultly fusible metal with diamond dust, and heating the mixt. in a closed mold in an elec. arc or resistance furnace. The product is a carbide which may contain excess C in the form of diamond particles, particularly in the center of the mass. Other metals such as Fe and Ti may be added to the mixt. before heating. (*C. A.*)

72. Artificial corundum. H. A. RICHMOND and R. MACDONALD, JR. U. S. 1,413,785, Apr. 25. Impure Al_2O_3 is melted, a portion of the Si and Fe oxides is reduced by C in an elec. furnace (without materially reducing the Ti oxide which is present to not more than 0.6%) and the mass is allowed to cool. (*C. A.*)

Stoneware, Whiteware and Porcelain

73. The influence of fuels containing sulfur on lead glazes. ANON. *Keram. Rundschau*, **30**, 280(1922).—Sulfureous gases only affect the glazes when the fumes come in contact with the ware. If the draft is good this does not occur in a muffle or semi-muffle kiln, but when the draft is sluggish these fumes permeate through the muffle and combine with the glazes causing a dull gloss. When using a semi-muffle kiln the ware should be protected by means of slabs, so placed as to prevent the gases from coming in direct contact with the ware. Firing with a reducing atm. after the glaze has commenced to melt will prevent dull glazes. H. G. SCHURECHT

74. Artificial teeth. ANON. *Keram. Rundschau*, **30**, 280(1922).—The bodies are rich in feldspar and are fired to cones 5–7. TiO_2 and Fe_2O_3 are added for color. H. G. S.

75. Collophane, a much neglected mineral. A. F. Rogers. *Am. J. Sci.*, **3**, 269–76 (1922).—Collophane is amorphous Ca "carbophosphate," usually massive, sometimes oölitic, sp. gr. 2.6 to 2.9, varying with its porosity and compn.; the hardness varies from 3 to 5, and n from 1.57 to 1.63. Collophane is the main constituent of *phosphate rock*. Analyses of 4 foreign specimens are recorded, also one from Crawford Mts., Utah, which gave: CaO 50.97, MgO 0.22, Fe_2O_3 + Al_2O_3 0.76, Na_2O 2.00, K_2O 0.47, SiO_2 0.30, P_2O_5 36.35, CO_2 1.72, F_2 0.40, SO_4 2.98, H_2O 1.05, insol. 1.82, sum 99.04%. The mineral may be regarded as a solid soln. of CaF_2, $CaSO_4$, $CaCO_3$ and CaO in $Ca_3(PO_4)_2$. Like most other amorphous minerals it is of colloidal origin and contains an indefinite amt. of water. Formula: $3Ca_3(PO_4)_2.nCa(CO_3, F_2, SO_4, O).(H_2O)_x$, where n is an indefinite number varying from 1 to 2. The carbonate radical usually predominates over the other minor constituents. L. W. Riggs (*C. A.*)

BOOK

76. Meissner Porzellan. Doenges, Willy. 2nd Ed. Dresden: Wolfgang Jess. 236 pp. M 75, bound M 95. Reviewed in *Tonind. Z.*, **45**, 1257(1921). (*C. A.*)

PATENTS

77. Filter press with a rotary filter. R. D. Lucas. U. S. 1,415,461, May 9. (*C. A.*)

78. Potter's clay. R. L. Cawood. U. S. 1,414,254, Apr. 25. A potter's clay having the properties of true kaolin is prepd. by subjecting a natural mixt. of partially and wholly kaolinized feldspar to comminution in H_2O and removing mica and excess H_2O. (*C. A.*)

Art and Design

79. Black porcelain glazes. Anon. *Keram. Rundschau*, **30**, 280(1922).—Two kgs. of coloring oxide are used to 50 kgs. of glaze. The following coloring oxides are usually employed: U_3O_8, CoO and Mn_2O_3. H. G. S.

80. A comparative study of methods used for the measurement of color. T. Martin Lowry and L. P. McHatton. *J. Oil Colour Chemists' Assoc.*, **4**, 189–204 (1921). F. A. Wertz (*C. A.*)

81. Color measurement. Heinrich Trillich. *Farben-Ztg.*, **27**, 1721–3, 1794–8, 1874–6, 2017–22(1922).—A criticism of Ostwald's system of color designation (*C. A.*, **14**, 492) and a suggested modification of his color circle. F. A. Wertz (*C. A.*)

82. Theory and practise in color measuring and recording. A. E. Bawtree. *J. Oil Colour Chemists' Assoc.*, **4**, 165–88(1921).—A discussion of the system of designating colors as described by Lawrence (*C. A.*, **13**, 1643) and their measurement according to this system with the Bawtree colorimeter (*C. A.*, **15**, 2). F. A. Wertz (*C. A.*)

83. Color circles. W. H. Thomas. *Textile Colorist*, **44**, 241–2(1922).—Describes a circle system of shading which shows the shade produced by mixing any 2 colors, and its comparative brightness. Chas E. Mullin (*C. A.*)

Heavy Clay Products

84. Durability of cement drain tile and concrete in alkali soils: Third progress report (1919–20). G. M. Williams. *Bur. Standards, Tech. Papers*, No. **214**.—The third progress report on the investigation of the durability of cement drain tile and concrete exposed to alkali soils and waters gives an account of the condition in 1919 and 1920 of exptl. drains laid in western alkali districts in 1913, and of large concrete blocks similarly exposed in 1915. Both drain tile and concrete blocks were made up in sufficient quantity and variety to be representative of all qualities, and were installed in typical alkali sections of the arid belt from New Mexico to Montana. With reference to drain

tile the following tentative conclusions have been drawn: (1) The use of cement drain tile in soils where sulphates occur in considerable quantities is hazardous. In certain localities the best quality of tile disintegrated within six years. (2) Porous or permeable tile, made from lean or dry mixts., are subject to disintegration in sulphate waters of relatively low concn. (3) Disintegration of mortar or concrete in sulphate waters may be due in part to physical forces arising from crystn. of salts in the pores, but it is primarily due to chem. attack upon the cement. (4) In the best quality of tile the outer skin may sometimes remain apparently unaffected, at the same time allowing the alkali water to pass through and attack the mass underneath. (5) In tile of given quality exposed to sulphate waters, the disintegrating effect seems to vary with the concn. (6) Tile made by hand or with the packer-head type of machine, and of sufficiently dry consistency to permit immediate removal of the molds, are less resistant to alkali action than tile of a wetter consistency which requires their retention in the molds for a period of hours. (7) Tile cured with steam seem to be no more resistant to alkali attack than those cured by systematic sprinkling. Tar and cement grout coatings were not effective in protecting the tile. (8) If cement drain tile are to be used in soils or waters containing more than 0.1% of sulphates, careful consideration should be given to sub-surface conditions, the quality of tile to be used, etc. (9) Quality of cement drain tile can best be measured by permeability tests. There appears to be little definite relation between permeability and the related factors of porosity, absorption, and density. With regard to concrete the following tentative conclusions have been drawn: (1) Materials of good quality and proper workmanship are of great importance in the fabrication of concrete exposed to alkali soils and waters. (2) Surface action on concrete blocks of good quality after 1 year's exposure has in most cases been progressive. (3) The extent and rapidity of disintegration depends upon concentration of soluble sulphates. (4) Disintegration of concrete blocks containing reinforcing rods has in some cases been aided by corrosion of the rods and consequent splitting of the concrete. (5) Concrete structures exposed to alkali waters should be given all possible protection by drainage. (6) Concrete of the best quality will disintegrate if exposed to sufficiently high concns. of alkali, such as were encountered in some of the locations where the test blocks were installed. (7) So far as the tests indicate, the resistance to alkali action of mass concrete, made of the same aggregates and exposed to the same concns., varies with the cement content or richness of mix. This again seems to indicate that strength and permeability, rather than absorption, are the governing factors in determining the quality and durability of concrete under alkali exposure. This paper carries two appendixes, one containing a summary of the absorption tests on samples of all types of drain tile used in the investigation, and the other a discussion of the occurrence of sol. salts in the soil and their action on cement and concrete. H. F. S.

85. Manufacture of sewer pipe. ANON. *Keram. Rundschau*, **30**, 301(1922).—The firing of sewer pipe can be done most economically in coupled kilns, whereby the hot gases pass through at least 3 kilns and the heat from the cooling kilns is utilized in the heating up the newly set ware. In this manner the heat is more thoroughly utilized and about 50% of the fuel is saved over that used by the periodic system.

H. G. SCHURECHT

86. Increasing kiln volume without more kilns. ANON. *Brick and Clay Record*, **61**, 102–5(1922).—The Minter flue system is described. This system permits continuous burning in periodic kilns, saves fuel and speeds up burning. This system will work on practically any plant with moderate changes. H. G. SCHURECHT

87. The dielectric anomalies of silica glass. A. JAQUEROD AND H. MUGELI. *Arch. sci. phys. nat.*, **4**, 10–26(1922).—An introductory sketch of theories of dielectrics. Exptl. results are promised later. E. D. WILLIAMSON (*C. A.*)

88. Clay pipe pronounced equal to cast iron pipe. S. E. Dibble. *Brick and Clay Record*, **61,** 34(1922).—D. established (1) that a proper bituminous compound can be used efficiently in jointing a clay pipe; (2) that joints made in this manner developed will stand any pressure that the pipe is capable of standing, without leaking; (3) that a pipe line so jointed can be thrown out of alignment without causing a leakage at the joints, and (4) that leaks due to poor workmanship can be repaired easily and quickly.
H. G. Schurecht

89. Manganese for improving quality. Anon. *Brick and Clay Record*, **61,** 32–33(1922).—By the use of Mn., better color can often be produced in brick; light burn and buff brick can be made into beautiful French gray shades; remarkable and unusual speckled effects can be produced; red burning clay can be made to produce the very popular brown shades; and better colors can often be produced in drain tile and hollow-tile which burn to unsightly colors. H. G. Schurecht

Glass

90. Unbreakable glass. Anon. *So. African Jour. of Ind.*, **5,** 237(1922).—At one of the oldest glass factories in Bohemia, after many years of experiment, a glass has been produced, which is claimed to be absolutely unbreakable. Receptacles made from the material can be thrown about, made red hot, and then put into cold water, without breaking. Hammers can be made from it and it is difficult to cut it even with a diamond. It is important to note, however, that this invention can only be placed on a commercial basis when a special kind of sand is available in large quantities. At the present time it exists only in the neighborhood of Dresden and in small quantities. The original founder of the factory was an ordinary glass blower, who rose to fame by his production of chemical glass. O. P. R. Ogilvie

91. Glasses colored with copper oxide. Albert Granger. *Le Verre*, **2,** 73–4 (1922).—A blue glass may be obtained from the following:

$$\left.\begin{matrix}2.5\\3.0\\3.5\end{matrix}\right\} \; SiO_2 \; \left\{\begin{matrix}0.05\ CuO\\0.25\ CaO\\0.70\ Na_2O \text{ or } K_2O.\end{matrix}\right.$$

Substitution of 0.25 CaO, BaO, ZnO, or PbO in the 3.5 SiO_2 formula does not cause any change in the color. In the 3.0 SiO_2 glass, 0.25 MgO developed a poor blue. Lowering the alk. and increasing the lime gives a blue-green as in 2.5 SiO_2, 0.05 CuO, 0.45 CaO, and 0.50 Na_2O or K_2O. Increase in CuO to 0.10 causes this glass to become green, further additions of CuO causing the glass to darken. In the following a green effect is noticed as the lime increases:

$$3.5\ SiO_2 \; \left\{\begin{matrix}0.05\text{–}0.05\text{–}0.05\ CuO\\0.25\text{–}0.45\text{–}0.55\ CaO\\0.70\text{–}0.50\text{–}0.40\ Na_2O\end{matrix}\right.$$

A blue-green glass is obtained from an increase in the CuO:

$$3.0\ SiO_2 \; \left\{\begin{matrix}0.10\text{–}0.10\text{–}0.17\ CuO\\0.20\text{–}0.40\text{–}0.41\ CaO\\0.70\text{–}0.50\text{–}0.42\ Na_2O\end{matrix}\right.$$

More acid glasses will also have a blue-green color:

$$3.5\ SiO_2 \; \left\{\begin{matrix}0.05\text{–}0.10\text{–}0.25\text{–}0.25\ CuO\\0.45\text{–}0.65\text{–}0.50\text{–}0.25\ CaO\\0.50\text{–}0.25\text{–}0.25\text{–}0.50\ Na_2O \text{ or } K_2O\end{matrix}\right.$$

In the glass 3.5 SiO_2, 0.05 CuO, 0.70 CaO, 0.25 Na_2O, where the lime is much in excess, the copper is pptd. by touching the hot melt with a cold body. *Effect of alumina.*

Addition of 0.1 Al_2O_3 to 3.5 SiO_2, 0.05 CuO, 0.25 CaO, 0.70 Na_2O showed no effect.

Effect of boric anhydride. The following glasses have a very rich peacock blue tint:

$$3.0\ SiO_2 \left\{ \begin{array}{l} 0.05\text{–}0.10\ CuO \\ 0.25\text{–}0.20\ CaO \\ 0.70\text{–}0.70\ Na_2O \end{array} \right. \quad 0.5\ B_2O_3$$

On increasing the B_2O_3 content, the glasses are much darkened:

$$2.5\ SiO_2 \left\{ \begin{array}{l} 0.05\text{–}0.15\ CuO \\ 0.20\text{–}0.15\ CaO \\ 0.70\text{–}0.70\ Na_2O \end{array} \right. \quad 1.0\ B_2O_3$$

Besides the deepened color, these glasses appear green-black by reflection. The simultaneous addition of B_2O_3 and Al_2O_3 seems to give more transparency to the glass than with the B_2O_3 alone, as in:

$$\left. \begin{array}{l} 2.5\ SiO_2 \\ \\ 1.0\ B_2O_3 \end{array} \right\} 0.25\ Al_2O_3 \left\{ \begin{array}{l} 0.15\ CuO \\ 0.15\ CaO \\ 0.70\ Na_2O \end{array} \right.$$

and

$$\left. \begin{array}{l} 3.0\ SiO_2 \\ \\ 0.5\ B_2O_3 \end{array} \right\} 0.10\ Al_2O_3 \left\{ \begin{array}{l} 0.05\ CuO \\ 0.25\ CaO \\ 0\ 70\ Na_2O. \end{array} \right.$$

Effect of ferric oxide. The addition of 0.027 Fe_2O_3 to 2.5 SiO_2, 0.11 CuO, 0.36 CaO, 0.53 Na_2O gave a true green, whereas the base glass did not. LOUIS NAVIAS

92. The manufacture of reflecting surfaces. K. GUNDLACH. *Naturwissenschaften,* **10,** 117–9(1922).—A discussion of a recent symposium (*"A Discussion of the Making of Reflecting Surfaces held on Nov. 26, 1920 at the Imperial College of Science and Technology, So. Kensington,"* Fleetway Press. Holborn). The subjects are treated historically, scientifically and technically and include (1) a survey of the bibliography on metallic deposition on glass; (2) a bibliography of the important papers on the construction and nature of reflecting surfaces; (3) the formaldehyde process of silvering; (4) workshop notes on silvering; (5) silvering of glass reflectors by chem. deposition; (6) silvering of a large reflector; (7) silvering of quartz and glass fibers; (8) mirrors used for reflecting heat radiation; (9) deposition of metals by cathodic sputtering *in vacuo;* (10) production of mirrors by cathodic bombardment; (11) Pt reflecting surfaces prepd. by the burning-in process; (12) mirrors for use in optical instruments under industrial conditions and (13) a photometric method of measuring the reflecting power of mirrors. C. C. DAVIS (*C. A.*)

93. Glass-lined tanks. G. F. KROHA. *Ungerer's Bull.,* **3,** 21–2(1922).—The gradual development of the industry, the construction of the various forms and the final coating with glass are described in considerable detail. W. O. E. (*C. A.*)

94. New recuperative pot furnace. W. R. CULBERTSON. *Glass Worker,* **41,** No. 34, 11, 29(1922).—The Chapman Stein recuperator applied to pot furnaces gives more accurate temp. control. Records from such a 14-pot furnace (each pot holding a batch of 2400 lbs.) which has been in operation in this country for nearly a year also show that from 10–15 more pots per week are obtained from this furnace with about 35% less fuel than from an adjacent regenerative furnace of the same size. J. B. P. (*C. A.*)

95. Effect of the rays from radium, X-rays, and ultraviolet rays on glass. J. R. CLARKE. *J. Soc. Glass Technology,* **5,** 155–65(1921).—A series of soda-lime glasses of the same compn., except that some contained Se, some Co oxide, and others no admixture, has been exposed to the action of α-, β- and γ-rays, β- and γ-rays, γ-rays, X-rays, and ultraviolet rays, resp. All glasses contg. Se or Co oxide were colored brown by β-rays, the depth of coloration corresponding with the range of the β-particles in the glasses. The intensity of coloration was greatest at the surface, decreased toward the interior, and in-

creased with increasing Se or Co oxide content. As the radiation was prolonged, the intensity increased to a max., which depended on the percentage of coloring agent, and then remained const. The pure soda-lime glass was only affected by α-rays, being faintly colored on the surface only. None of the glasses was affected by X-rays, γ-rays, or ultraviolet rays. All the glasses fluoresced in Ra Em, but a fatigue effect was observed at about the same time as the attainment of max. intensity of coloration. The coloration of glasses is regarded as due to the formation of colloidal particles in the glass. The presence of such particles is explained as being due to the action of α- or β-rays on ions already present in the glasses. The fluorescence is held to be due to mechanical bombardment of the glass mols. by the rays. J. C. S. (*C. A.*)

96. An autoclave test for the grading of chemical glassware. W. L. Baillie and F. E. Wilson. *J. Soc. Chem. Ind.*, **41**, 45–56T(1922).—Contains much exptl. work. Important. Can not be abstracted. G. E. Barton (*C. A.*)

PATENTS

97. Glass. W. C. Taylor. U. S. 1,414,715, May 2. A flesh-colored glass of high ultra-violet absorption and good visible transmission is formed with a content of 3–6% CeO_2 and 0.2% MnO_2, together with SiO_2, K_2O, Na_2O and CaO. Cf. *Ceram. Abs.*, **1**, 216(1922). (*C. A.*)

98. Compound glass sheets. J. Cox. Brit. 175,044, Nov. 6, 1920. In making compd. glass sheets, the surfaces are treated with a soln. composed of gum mastic, amyl acetate, pyroxylin or collodion, and ricinol oil, dissolved in abs. alc., and superposed sheets are subjected to pressure at a temp. which allows superfluous liquid to escape. When cool, the edges are treated with linseed oil, and the sheets are again heated and pressed; and the edges of the finished sheets are finally sealed with a soln. of shellac in methylated spirit. (*C. A.*)

99. Glass. H. T. Bellamy and B. T. Sweely. U. S. 1,415,980, May 16. A non-electrolytic glass suitable for use as a binder for high-resistance compns. is formed of silicates and borates of Ca and Ba. (*C. A.*)

100. Glass. Titanium Pigment Co., Inc. Brit. 176,430, Oct. 29, 1920. TiO_2, is introduced into glass batches in the ratio of not less than 25% of the whole. *E. g.*, silica 69 parts by wt., borax 10, Na_2CO_3 29, CaO 7, TiO_2 45. (*C. A.*)

Cement, Lime and Plaster

101. Analysis of gypsum in cements—quick method. C. Bertin. *Rev. Mat. Constr. Trav. Pub.*, **154**, 133(1922).—*Ordinary method.* 1–2 gm. of cement are dissolved in hydrochloric acid, and the silica removed after evapn. to dryness, by filtering the remoistened residue. The sulphur trioxide is then pptd. as barium sulphate, which is filtered off, ignited and weighed. Time, about 3 hrs. *Quick method.* 1 gm. of cement is boiled in 50–60 cc. of distilled water, containing 2 gm. of ammonium chloride for 8–10 mins. Pass the soln. through an ordinary filter, acidify the filtrate (*a*) with hydrochloric acid, and bring to a boil, add a pinch of barium chloride crystals, continue boiling for 5 mins., then let stand $^1/_2$ hr. Filter off the barium sulphate, wash, ignite and weigh. Time, about 1 hr. The ammonium chloride increases the soly. of the gypsum in the water soln., the gypsum passing into the filtrate (*a*). As a small quantity of lime is also dissolved, it is necessary to convert it to the chloride before adding the barium salt. The results of this method compare favorably with those obtained by the longer methods. Louis Navias

102. Plant of the Mozambique Portland Cement Co., Ltd., at Lourenco Marques. Anon. *Jour. Chem. Met. & Min. Soc. of So. Africa*, **22**, 203(1922).—The Portland cement factory of the Mozambique Cement Co. will have an output of 700 tons of Port-

land cement per week. The method of manuf. is upon the wet process. The raw materials are brought to the factory by barge, where they will be unloaded upon a jetty and transferred to the factory. The limestone is fed to jaw crushers, 1,000 mm. by 500 mm., after which it passes through crushing rolls. This reduces the limestone to approx. walnut size. It is then elevated into a hopper over a compd. ball and tube mill, 11 m. long and 1.8 m. in diameter. The clay, when delivered to the factory, is first dealt with in a wash-mill, after which it is pumped into the compound ball and tube mill and ground with the limestone. Water is introduced into the grinding mill, and the limestone and clay are ground together in the wet state (about 40% of water) to a fineness of about 10% on 180-mesh sieve. The "slurry," as it is termed, coming from the compd. ball and tube mill is elevated into one of three mixers, where it is thoroughly mixed and proportioned. One mixer is of sufficient capacity to enable the kiln to run over the week-end without refilling. The slurry transport and agitation is carried out in a special manner. Hitherto, slurry has been pumped by plunger or centrifugal pumps, and agitated mechanically. In this factory, however, completely new methods are introduced, and the slurry is elevated by means of pressers and is agitated in the tank by means of blasts of compressed air. When found to be of correct proportions for calcining, the mixing tank is sealed and is used for the supply of the kiln. The kiln itself is 56 m. long and 2,800 to 2,300 mm. in diameter. The plates in the firing zone are approx. $^7/_8$ in. in thickness, and the kiln is furnished with four cast-steel rollers and a cast-iron rim for the drive. The cooler is attached to the kiln in prolongation. This attachment permits of several advantages, notably, only one motor to drive, instead of two where the cooler is separate; much lower foundations; absence of stairs, gangways, etc., and perfect accessibility and easy attendance. Furthermore, no movable kiln head is required; and a considerable saving through the utilization of heat radiated from the material passing through the cooling section is effected. Coal is supplied to the kiln in the following manner: When delivered to the factory by trucks run in on the company's siding, the coal is first crushed and thoroughly dried in a rotary drier. It is then passed through a small compound ball and tube mill, 8 m. in length and 1.4 m. in diameter. It is then elevated into a storage hopper, from which it is wormed into the coal feed pipe through which a continuous blast of air passes by means of a high-pressure fan. The clinker coming from the cooler is taken on a shaker conveyor to the boot of an elevator, which elevates on to another conveyor running over the whole length of the clinker store. Sufficient storage has been allowed for four weeks' out-put at the rate of 1,400 T. per week (the factory is so designed as to permit of duplication in the near future). The clinker is reclaimed by a conveyor running underneath the clinker store house, and after the gypsum has been added is elevated over a compound ball and tube mill for clinker grinding. The cement is ground to a fineness of 8–10 per cent on 180-mesh sieve, and is wormed and elevated into the cement store, where automatic sack-packing machines have been provided. (*So. African Eng.*, February, 1922 (A. K.).) O. P. R. OGILVIE

103. Tests on mortars and concrete immersed in sea water for 15 years. E. CANDOLT. *Rev. Mat. Constr. Trav. Pub.*, **153**, 105–6(1922).—Results of test pieces made at Haïphong, Indo-China. Large blocks were cemented onto the rocks, so that they were completely covered at high tide and uncovered at low tide by the sea water for 15 yrs. Cement N° 1, used for sea construction work had the following properties:— % chem. comp., SiO_2 22.20, Al_2O_3 6.85, Fe_2O_3 2.00, CaO 66.05, MgO 0.25, SO_3 0.50, ignition loss 2.15, apparent d. 1.228, time of set 4 hours, tensile strength in Kgs. per sq. cm. on pure cement, after 7 days, 34.0, 28 days 45.0, $2^1/_2$ years 57.7, on 1:3 plastic mortar, after 7 days 12.0, 28 days 15.0, $2^1/_2$ years 34.0. Cement N° 3 (not intended for sea construction work), % chem. compn., SiO_2 21.65, Al_2O_3 6.90, Fe_2O_3 1.95, CaO 64.75, MgO 0.30, SO_3 0.60. Ignition loss 3.85, apparent d. 1.182, time of set 3 hrs. 10 mins.,

tensile strength, on pure cement, after 7 days 37.9, 28 days 50.5, $2^1/_2$ yrs. 59.2, on 1:3 plastic mortar, after 7 days 19.2, 28 days 26.5, $2^1/_2$ yrs. 32.3. Compression tests were made on cubes of 10 cm. side, cut from the large pieces after 15 years' immersion. Results given are for the average of 6 tests for each mixt., in Kg. per sq. cm. Mortars. To 1 cubic meter of sand, 250 Kg. Cement N° 1, 213.33 Kg. per sq. cm. 450 Kg. Cement N° 1, 323.5, 650 Kg. Cement N° 1, 504.16, 450 Kg. Cement N° 3, 480.8, 650 Kg. Cement N° 3, 697.5, 1,000 Kg. Cement N° 3, 710.83. Concrete. 450 Kg. Cement N° 3, 1 cubic meter sand, 1.5 cubic meters pebbles, 336.66, 1.000 Kg. Cement N° 1, 1 cubic meter sand, 2 cubic meters pebbles, 492.5.

LOUIS NAVIAS

BOOK REVIEWS

A valuable addition has been made to the library of ceramic publications. This is the "1922 Clay Products Cyclopedia," published by Industrial Publications, Inc., 407 South Dearborn Street, Chicago, Ill. The book consists of two main parts, the first information on definitions and statistics, and the second, catalog pages of the manufacturers of equipment. The definitions cover 117 pages and describe 752 processes, materials and pieces of equipment. These definitions are amply illustrated. The statistical section covers 75 pages, arranged and indexed for instantaneous reference. This section is valuable in order to save the time of an executive in searching for the necessary data.

An original index is one called the Departmental Index of Plant Equipment. In this index are listed the numbers of all items that are used in or concern each department. The numbers of the items refer to the definitions. In this way the reader can easily find all related topics, and determine through the definitions the one best adapted to the use he has in mind.

The catalog section contains informative data regarding the equipment and materials manufactured by the different firms supplying the industry.

The value of the Cyclopedia lies in the fact that it combines in one book information which the clay products manufacturer would otherwise be compelled to search for in various catalogs, reference and technical books.

This book is published by the same organization that publishes *Brick and Clay Record.* The combination gives to the clay products manufacturer all possible information that he requires. The periodical treats of current topics, new developments, improvements, trade matters, and association and convention items. The Cyclopedia, being a year book, furnishes all necessary information for reference use bound in one volume.

This book is being received with great interest throughout the industry.

F. A. GUIGNON

Proposed Scientific Journal

The preliminary issue of the *Journal of Scientific Instruments* has been received and will prove of exceptional interest to the readers of this *Journal.* An introductory article in the *Journal* explains the importance of issuing a British Journal of this type but unless sufficient subscribers are obtained the publication will be discontinued. The *Journal* is a monthly publication dealing with the principles, construction and use of instruments. The contents of the preliminary number together with the list of articles in prospect give promise that the *Journal* will occupy a position of importance among the scientific journals. Among the articles listed are the following: "The

Scheme for a Journal of Scientific Instruments" by E. H. Raynor; "Instruments and Apparatus in Relation to Progress in Physiology" by A. V. Hill; "The Use of a Reference Plate for the Micrometric Measurement of Astronomical Photographs" by Sir Frank Dyson; "The New Fundamental Bench Mark of the Ordnance Surveys" by Sir Charles Close; "The Optical Sonometer" by F. Twyman and J. H. Dowell; "Two Machines for Rapidly Weighing Loads of a Few Milligrams" by The Research Staff of the General Electric Co., Ltd., London; "Reid Control Indicator for Aeroplanes" by Dr. J. Robinson; "The Measurement of the Internal Diameters of Transparent Tubes" by John S. Anderson, and a number of others. Copious advertising in this issue has enabled the editor to obtain the best of paper and printing and the cuts are many and good. The *Journal* is published by the Institute of Physics, London, with E. H. Raynor as acting editor.

Official Personnel of Divisions 1922–23

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CERAMIC ABSTRACTS

Compiled by the

AMERICAN CERAMIC SOCIETY

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General and Miscellaneous

1. The influence of small amounts of electrolytes on stability of clay suspensions and their use in purification of clay. H. KOHL. *Ber. der Deut. Keram. Gesellschaft*, **3**, Pt. 2, 64–77(1922).—The stabilizing effect of Na_2CO_3 and Na_2SiO_3 on suspensions of clay, quartz, mica, pyrites, and iron oxides was investigated. All these materials in fine suspension in dil. alk. soln. are negatively charged and on electrolysis are deposited at the anode; hence it is not possible to purify a clay by the electrosmosis process, which merely acts as a filter. The impurities in clay are pptd. at lower concn. of alk. than kaolin, and can be partially removed by a correct regulation of the alk. concn. in the settling tank. It is possible to stabilize a clay free from polyvalent salts with much less alk. than is needed when such salts, as $CaSO_4$, etc., are present. The viscosity of a clay slip was found to reach a min. with 0.3% Na_2CO_3, while it had a max. stability with 0.83%. The adsorption of ions by kaolin was measured by adding it to solns. of Na_2CO_3 and Na_2SiO_3 and detg. the cond. in an ordinary Bunsen cond. cell. The cond. decreased nearly proportionate to the amt. of kaolin added. The stabilizing effect of alk. at low concn. is attributed to the mutual repulsion of the neg. charged particles. As the concn. of the alk. exceeds the max. stabilizing value, the coagulating influence of the cation begins to predominate. E. N. BUNTING

2. Benefits of technical and scientific research. ROSS C. PURDY. *Glass Worker*, **41**, No. 47, 11(1922).—Address before the Window Glass Manufacturers Ass'n. R. J. MONTGOMERY

3. New uses for clay. ANON. *London Times Trade Supp.*, **10**, 374(1922).—Describes uses of clay: (1) In the manuf. of rubber, (2) rubber latex, a new material for water-proofing paper and linoleum. China clay and rubber may be utilized as road surface material possessing a high resistance and dust-combating qualities. Describes expts. made to increase hard-wearing qualities of rubber by addition of mineral substances to obviate the tedious series of cures for each mixing, by using a base mix contg. rubber, 100 pts. (by wt.), litharge, 30 pts., sulphur, 5 pts. Stress-strain curves were obtained. China clay vies with zinc oxide as reinforcing agent, although the breaking tension is less well maintained. The toughening effect of various pig-

ments was arrived at by a consideration of conditions governing abrasive wear, as in automobile thread. The object was to increase the energy absorption of rubber to lessen stressing the rubber substance past its rupture point. Barytes continuously diminished the energy content while china clay increased it. China-clay producers are keenly interested in expts. with road-surface materials since the substance counteracts the stress on the rubber that causes rupture. O. P. R. O.

4. Canadian institute of chemistry. H. J. Roost. *Can. Chem. & Met.*, **6**, 128.—The report of the Secretary shows the institute to have progressed favorably in its organization and to be now ready to enter upon the work for which it was created, that is "To raise the profession of Chemistry to its proper position among the other learned professions" and "To look after and promote the professional well-being and interests of Chemists" and to assist in the development of the Dominion of Canada.

O. P. R. Ogilvie

5. Technical excursion in the north and in Belgium. Anon. *Céramique*, **25**, 193–7, 241–51(1922).—The French Society of Ceram. Manufs. took an excursion through N. France and Belgium and visited a large number of ceramic plants.

H. G. Schurecht

6. German glass society. Anon. *Keram. Rundschau*, **30**, 325(1922).—On July 9, a meeting was held for the purpose of organizing a German Glass Society. Their address is Frankfurt a. M. Gutleutstrasse. H. G. Schurecht

7. Plant of the Huron Clay Products Co. Anon. *Clayworker*, **78**, 148–9(1922).—The brick and tile plant at Croswell, Mich., is described, in which the Boss system of drying and burning is employed. H. G. Schurecht

8. The third annual meeting of the German Ceramic Society. Anon. *Keram. Rundschau*, **30**, 309–11, 318–20, 325–7(1922).—At this meeting the following papers were given: (1) Fine stoneware, by W. Pukall; (2) Study of porcelain with low firing temps., by W. Funk; (3) The testing of ceramic bodies for artificial teeth, by H. Eisenlohr; (4) The use of geology in ceramics, by W. Braun; (5) The ceram. industry of U. S., by K. Endell; (6) The influence of typical fire clays on the behavior of refractory bodies at high temps., by W. Steger; (7) The coeff. of expans. and several other physical properties of whiteware and its dependence upon the compn. and firing temp., by H. Kohl; (8) The influence of compn. of porcelain upon its properties by R. Rieke; (9) Construction in the ceram. industry, by U. Sauer. (Abstracts of the above papers are given.) H. G. Schurecht

9. CO_2 in flue gas when burning oil. Anon. *Brick & Clay Record*, **61**, 259 (1922).—An error in interpreting the CO_2 content in flue gas when burning oil is likely to arise among engineers who have been familiar with coal burning. This comes from the fact that perfect combustion of coal would give a higher CO_2 reading than perfect combustion of oil. The explanation of this lies in the greater amount of H in the oil. The H requires O for its combustion and this in turn brings N which appears in the flue gas. The H does not produce CO_2 and the water vapor that it does produce does not appear in the flue gas analysis. The result is that the higher the H content in the fuel the lower the theoretical per cent CO_2 in the flue gas. H. G. Schurecht

10. Report of experiments on producer-gas. K. Morimoto. *J. Jap. Cer. Assoc.*, **341**, 149–51; **342**, 187, 192; **343**, 230–3(1921).—At window-glass works of the Asahi Glass Co., producer-gas is used in hot state except a small portion. The author, noticing that the usual method of sampling gas and its quant. analysis after it is cooled did not indicate the true nature of the gas, attempted the quant. analyses of water-vapor and tarry matter besides usual constituents. The several methods failed. After many trials, a new app. was designed which has proved to be satisfactory enough for factory use. The app. consists of 4 flasks, an elec. fan and a gas-meter. Hot

gas is forced to pass successively through the flasks by the suction of fan which discharges the gas to the gas-meter. The first flask is partly filled with water or heavy oil to which the end of tube, leading hot gas, dips and has also a tin-plate cylinder filled with broken glass or beads at the end of exit tube while the other 3 are empty; the second flask has a cylinder similar to the former; the third flask is just like the second except the cylinder, which is filled with glass-wool; the last flask has a cylinder contg. absorbent cotton and a thermometer. The temp. of gas at the outlet of the last flask is kept 1–2°C higher than that of the room; the flasks are therefore cooled with water or ice. Sample is collected through a tube inserted downward into downcomer or side walls of gas-main. Now setting the fan in motion, about 10 cu. ft. of gas is taken. Water-vapor and tar, condensing in the cooler, are collected, and their amts. are detd. The compn. of the gas at the outlet of the gas-meter is detd. in usual way. In calcg. the vol. of vapors, assumptions are made that tar consists of naphthalene and also that water and tar exist in gaseous state at ordinary temps. The expts. at a factory revealed poor nature of the hot gas, therefore many improvements on the producers and their manipulation were undertaken. The following table shows the compns. of the producer-gases before and after improvements:

TABLE I

		CO_2	O_2	C_2H_4	CO	CH_4	H_2	N_2
Before impr.	Cold gas	7.28%	0.56%	0.68%	16.30%	5.20%	13.54%	56.44%
	Hot gas	5.78	0.45	0.54	12.95	4.13	10.76	44.97
After impr.	Cold gas	6.28	0.25	0.27	20.00	8.67	12.20	52.33
	Hot gas	5.72	0.23	0.25	18.20	7.90	11.10	47.66

		H_2O	$C_{10}H_8$	B.t.u. per cu. Shaku (net)	Combustion temp.	Temp. of gas
Before impr.	Cold gas	...	..	156.20	1578°C	20°C
	Hot gas	20.20	0.22	138.20	1494°	170°
After impr.	Cold gas	...	..	192.40	1606°	20°
	Hot gas	8.70	0.24	189.60	1637°	220°

The calorific power of gas increases as its water content decreases. However the water-vapor which is introduced by the moisture and combined water of coal is unavoidable, and its amt. is about 5.10% at the said factory. S. KONDO

11. The present condition of ammonia-soda industry in Japan and its future. S. NAKAHARA. *J. Jap. Cer. Assoc.*, **352,** 624–30(1921).—Descriptions on the demand of soda-ash in Japan and statistics on soda industry in foreign countries are given. The ammonia-soda plant which was established in 1917 by the Asahi Glass Co., manufacturers of window glass, has since had better experience, and is now mfg. about 10 T. of soda-ash a day. Raw materials, fuel and labor required for mfg. one T. of soda-ash in March, 1921, were as follows: 1.9 T. salt (85%), 1.5 T. limestone (98%), 1.1 T. coal (with 22% ash), 0.2 T. coke (with 29% ash), 0.014 T. ammonia and 10 workmen (8 hrs.). Cheaper supply of salt and prevention of dumping by foreign manufacturers are needed to the further development of the industry. S. KONDO

12. The plant manager and the chemist. GEO. L. O'BRIEN. *J. Ind. Eng. Chem.*, **14,** 650–1(1922). E. J. C. (*C. A.*)

13. Can the college do anything for industry? EDWARD ELLERY. *J. Ind. Eng. Chem.*, **14,** 544(1922).—The college can reduce the period of unproductiveness of their graduates when they enter industry by training them in the acquisition, recognition, application and description of facts, and finally in handling an original problem. For this purpose it is essential that there be (1) small instructional groups, (2) superior

students sepd. from inferior students, (3) strongest teachers in charge of freshmen and seniors, and (4) a limitation of the number of students and of the number of hours the good teachers teach. W. C. EBAUGH (*C. A.*)

14. The blue flame produced by common salt on a coal fire. W. HUGES. *Nature*, **109**, 683(1922).—Arguments are advanced to show that the blue flame which is seen when NaCl is thrown on a coal fire is due to CO produced by the cooling of the hot coal by the NaCl rather than to traces of Cu in the coal. ARTHUR SMITHELLS. *Ibid.*, 745.—The work of different investigators is quoted to show on the contrary that the blue color is due to $CuCl_2$, the source of the Cu being the pyrites of the coal.
W. H. ROSS (*C. A.*)

15. Crushing, storing and pulverizing. L. H. STURTEVANT. *Rock Products*, **25**, No. 3, 28–9(1922).—Almost entirely mechanical. The following topics are discussed: phosphate rock, unloading power shovels, crushing, pulverizing, air separators, dust collectors, storage, and labor requirements. E. F. PERKINS (*C. A.*)

16. Geography of electrochemistry. W. S. LANDIS. *J. Ind. Eng. Chem.*, **14**, 554–5(1922).—Hydro development possibilities of the five continents and the East Indies are discussed. The struggle for supremacy will be between the United States, Norway, India, China and Canada. W. H. BOYNTON (*C. A.*)

17. Industrial research. ANON. *Electrician*, **88**, 450(1922).—A short report on the activities of the Brit. Elec. & Allied Industries Research Assoc. Brief comments are included on micas, synthetic resins, insulating oils, turbine blades, etc.
C. G. F. (*C. A.*)

18. The future of industrial research. F. PEAKE SEXTON. *Electrician*, **88**, 627(1922).—A general discussion. "The personnel of the laboratory is the most important item." C. G. F. (*C. A.*)

19. The place of scientific research in the programs of trade associations. E. R. WEIDLEIN. *Chem. Age* (N. Y.), **30**, 241–3(1922). E. H. (*C. A.*)

PATENTS

20. Process of manufacturing liquid gold. JIRO ISHIKAWA. Japan 40,632, November 14, 1921. Sulphur-balsam is added to a soln. of gold chloride and the mixt. is heated on a water-bath. Sulphur-resin-gold, thus prepd. is washed and heated to evap. water. Then, aluminium resinate, uranium resinate and bismuth resinate are added. The product is dissolved in the mixt. of lavender and rosemary oils.
S. KONDO

21. Electrical insulation. R. E. OTTMAN. U. S. 1,418,730, June 6. A non-conducting fabric such as paper or cardboard is impregnated with a soln. of borax and NH_4 phosphate, dried and then coated with a mixt. of $CaCO_3$, ZnO and linseed oil.
(*C. A.*)

Apparatus and Instruments

22. Some of the difficulties encountered in maintaining a pyrometer installation in a works. ROBERT S. WHIPPLE. *Trans. Ceram. Soc.* (Eng.), **21**, 1–23(1922).—The pyrometer should be placed where the fireman can see the records readily. He thus soon regards it as a friend, whereas, if it is in the manager's office he thinks of it as a policeman. The following points are useful for standardizing thermocouples: Freezing point of tin, 231.8°C; of lead, 327.4°C; of zinc, 419.4°C. (The f. p. of zinc is particularly useful; detns. made on a sample continuously for 6 yrs. in one crucible gave strictly consistent results.) Boiling point of sulphur, 444.7°C; freezing point of antimony, 630.7°C; of sodium chloride, 800°C. (The f. p. of common salt (NaCl) 800°C is an extremely useful point, as small variations in the purity of the material make practically no difference.) Freezing point of silver, 960.8°C; of copper, 1083°C.

The galvanometer must be placed where it is not abnormally heated nor subject to temp. variation. If accuracy is desired, the temp. of the end of compensating leads must be controlled. The simplest way is to use a thermos flask filled with oil, the juncture of copper leads being placed near the bottom of the flask. The temp. of the surrounding air may change 20°C during 24 hrs., yet the temp. inside the flask remains const. to within 1°C. Another way is to bury the junction at a depth of 10 to 12 ft. below the floor. Works of any size should possess a potentiometer for checking the couples and galvanometers. Radiation and optical pyrometers are graduated to give the true temp. under black-body conditions. The industrial furnace practically fulfills these conditions. A closed fire clay or quartz tube (not less than 10 cms. internal diam.) built into a fur. gives almost ideal conditions. As long as the image of the hot body formed by the concave reflector is large enough to cover the small thermocouple in the pyrometer, the instalment is independent of the distance between it and the hot body. The importance of black-body conditions is greater in the case of radiation instruments. The only way to maintain a successful pyrometer installation is to make it definitely someone's business to look after the instruments. The substitution of a new porcelain or quartz sheath for a broken one will save the thermocouples and a good deal of worry. The leads and switches between the pyrometer and indicator or recorder must be kept clean and in good order. (See *Ceram. Abs.*, **1**, 199(1922).) H. F. S.

23. Pycnometer density determinations. R. Saar. *Chem.-Ztg.*, **46**, 433–5 (1922).—A series of tables, calcd. to 6 decimal places, for correcting to standard conditions densities detd. under a given set of conditions. Illustrated by problems. W. C. Ebaugh (*C. A.*)

24. Recording calorific value of gas. The Fairweather recording calorimeter. Anon. *Gas World*, **77**, 12–13(1922).—This instrument has been provisionally prescribed by the Gas Referees for producing continuous records at the Brentford Gas Plant. This calorimeter comprizes, briefly, a water-flow calorimeter of the Boys type, adapted to record continuously the total ht. value of the gas, reduced to standard temp. and pressure. This automatic and continuous operation is effected by combining with the calorimeter proper the following automatic devices: Means for supplying to the calorimeter a definite and measured water flow; means for automatically adjusting such flow to compensate for the effect of temp. and pressure conditions of the gas; a time-controlled wet meter adapted to supply gas uniformly to the calorimeter at a const. rate; a recording thermometer adapted to indicate the temp. rise imparted to the water passing through the calorimeter. This temp. rise is a direct measure of the calorific value of the gas and is converted into B. t. u. by appropriate ruling of the record sheet. Details are given by reference to a diagram. J. L. Wiley (*C. A.*)

25. An apparatus for handling deliquescent crystals. C. B. Slawson. *Am. Mineral.*, **7**, 25–6(1922).—The crystals are handled in a galvanized-Fe box with glass windows at top and front, the arms of the operator entering through rubber sleeves at either end. E. T. Wherry (*C. A.*)

26. Two machines for rapidly weighing loads of a few milligrams. Research Staff of The General Electric Co., Ltd., London (E. M. and C. G. Eden). *J. Sci. Instruments*, Prelim. No. **1922**, 15–21.—The two machines described were designed for sorting elec.-lamp filaments to an accuracy within 5% of their wt. A cantilever spring is used in the first machine and the motion of its end is magnified by optical projection 30 times. The scale (0 to 40 mg.) is 13 cm. long. The second machine consists of a small weighing beam controlled by a hair spring. Mechanical magnification between 10 and 100 times is obtained by a fine wire tension lever connecting to a wire hanging in a catenary under its own wt. The movement of the catenary wire is magnified optically 30 to 50 times. Curves showing sensitivity of balance, and effect

of stiffness of controlling spring and catenary are given. The speed of each balance is about 400 filaments per hr. D. E. S. (*C. A.*)

27. The thermel. W. P. WHITE. *Science*, **55**, 617–8(1922).—The classical names, thermocouple and thermopile, are awkward when applied to temp.-measuring instruments, which frequently include both at once, and where the mere number of parts is usually a secondary matter. A single term for all such instruments is desirable. The term "thermoelectric thermometer" is logical, but unnecessarily long; "thermoelement" is not logical, and its use has caused considerable confusion. The term "thermel," which is merely an abbreviation of "thermoelectric thermometer," is logical, short and definite, has met with general informal approval, and is urged as a desirable general term for all thermoelec. temp.-measuring devices. "Thermocouple" and "multiple thermel" (or "thermopile") may still be used in the few cases where it is desirable to call attention to the special construction of the thermel. W. P. WHITE (*C. A.*)

28. Union gas calorimeter. AXEL DANIELSON. *Teknisk. Tidskrift*, **52**, 313–4 (1922).—A modification of Strach's calorimeter, designed by O. Dommer, Karlsruhe, was tried out in a Stockholm gas plant. It is a very serviceable instrument. It gave caloric values which averaged 2% less than the Junker calorimeter.

A. R. ROSE (*C. A.*)

29. Röntgenographic determination of crystal arrangement. M. POLANYI. *Naturwissenschaften*, **10**, 411–6(1922).—Röntgenographic methods must be employed to det. whether a crystal lattice is changed by elongation of a single crystal. By means of a filament diagram it was found that for a Zn crystal (1) the lattice changes its orientation with respect to the longitudinal axis when elongated; (2) in the section drawn out to a flat band (cf. Schiebold, *Z. Physik*, **9**, 180(1922); Carpenter and Elam, *C. A.*, **16**, 1728; Gomperz, *C. A.*, **16**, 1387) the angle that the hexagonal axis of the crystal lattice makes with the longitudinal axis changes from 10° to 18° and (3) the cylindrical filaments resulting from further elongation of the flat bands have the same orientation of their lattices as the flat bands. It is maintained that this same kind of shift in the orientation of the lattice occurs in a Zn wire as in the individual crystal. A bibliography is appended. C. C. DAVIS (*C. A.*)

30. Total-radiation pyrometer. EBERHARD ZOPF. *Z. Ver. deut. Ing.*, **65**, 1267 (1921).—Brief description of the Siemens and Halske so-called Ardometer.

W. P. WHITE (*C. A.*)

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31. Brick-hacking machine. WILLIAM H. ALLEN. U. S. 1,414,998, May 2, 1922. In a hacking device for bricks and the like, the combination of means for feeding a plurality of bricks in succession, a turntable, a transfer car carried thereby adjacent the delivery end of said brick feeding means, and means for moving the turntable parallel to the direction of movement of the bricks in the brick-feeding means.

C. M. S., JR.

32. Lens-grinding machine. LEON G. SIMPSON. U. S. 1,415,613, May 9, 1922. The combination of a lens carrier and a grinding tool coöperating therewith, one of the parts having a recess on the side thereof opposite the other of the parts, a guide bar and a universal joint between the recessed part and bar comprising a bearing member within the recess and rounded on the bottom for pivotal movement in the recess and a pin pivotally connecting the bearing member and guide bar within and adjacent the bottom of the recess. C. M. S., JR.

33. Apparatus for reactions at high temperatures under pressure. A. T. STUART AND G. N. MIDDLETON. U. S. 1,417,585, May 30. The app. is adapted for *cracking hydrocarbons*. It comprizes a closed reaction chamber the wall of which is of a material

having a high elec. resistance by which it may be heated by elec. current to the desired reaction temp. The reaction chamber is surrounded by reinforcing material to support its wall against internal pressure. (*C. A.*)

34. Electrical precipitation of suspended particles from gases. E. R. Wolcott U. S. 1,416,769, May 23. Before pptn. by the action of an a. c., gases such as cement kiln or smelter gases are humidified to facilitate the pptn. of suspended particles from them. (*C. A.*)

Chemistry, Physics and Geology

35. The chemical composition of a rock known as the kaolin from Djebel Debar (Algeria). Albert Granger and Pierre Brémond. *Comptes Rendus*, **175,** 36–8 (1922).—The material is white and contains no mica and no quartz impurities; will not disintegrate after months of immersion in water. When crushed and well mixed with water, a sticky mass is obtained which seems to contain 2 constituents, (1) a hard inert material, (2) the material which is miscible with water. For porcelain it is ground with water in a ball mill. The chem. compn. is SiO_2 34.99, Al_2O_3 34.65, Fe_2O_3 0.22, CaO 0.55, MgO 0.04, K_2O 0.83, Na_2O 0.31, ignition loss 28.19. The Al_2O_3 content and the ignition loss are higher than for kaolins. It is much more easily attacked by acids than is kaolinite. Louis Navias

36. Chemical composition of alkalic feldspar. K. Seto. *J. Jap. Cer. Assoc.*, **343,** 237–40; **344,** 269–71(1921).—Hitherto published analyses of feldspars do not agree well with their optical consts., probably owing to the difference in samples. To make up the deficiency, the same crystals whose optical properties had been detd. by Prof. Kozu of the Tohôku Imperial University were analyzed as accurately as possible. The samples include albite of Alp Rishuna, orthoclase of Madagascar, moonstone of Ceylon, adularia of St. Gothard, same of Riedertobel and a native perthite. The composition of the perthite which is produced at Kutsuwatori, near Ishikawa, Fukushimaken, is as follows: 65.44% silica, 19.55% alumina, 0.05% ferric oxide, 0.12% magnesia, 0.49% lime, 3.77% soda, 10.78% potash, 0.18% loss on ignition and 100.38% in total. Mineral compn. of the perthite is, therefore, $Or_{63.8}Ab_{33.7}An_{2.5}$. The mineral is used in potteries. S. Kondo

37. The action of heat on refractory clays; and their rational analyses. K. Fuha. *J. Jap. Cer. Assoc.*, **351,** 566–98(1921).—The study was carried out with the object of getting full knowledge on clays used in the manuf. of pots for optical glass. The soly. of 6 clays in boiling conc. hydrochloric acid, and analyses of the solns. and residues are described. Soly. ranged 23–75% when boiled for $1^1/_2$ hrs., and 93–96% on boiling for 24 hrs. Lime and magnesia were almost completely dissolved. The loss on heating at various temps. is described. The temps. at which the wt. of Japanese clays decreases most rapidly are 400–500°C. The soly. of 7 clays, previously heated at various temps., in boiling hydrochloric acid is discussed. The result, in short, confirms that of A. N. Sokoloff in 1912. The methods of rational analysis and its published discussions are described. Clay, heated up to 800°C may be used for rational analysis; there were wonderful differences in the amts. of residues between clays, heated at 1000° or 1100°, and those heated at 1200°. This increase is due to those of alumina and silica, their ratio in equivalents being about 1:2. S. Kondo

38. Clays of the Mount Hongo in Fukushima prefecture. K. Hojo. *J. Jap. Cer. Assoc.*, **355,** 98–105(1922).—Hongo is one of the chief porcelain producing districts in Japan, the products being known as Aizu ware. Clays of the Mt. Hongo are chief body materials of the Aizu porcelain; they are decomposed liparite. Clays of the best quality have compns. as follows:

Name of clay	Ignition loss	SiO_2	Al_2O_3	Fe_2O_3	MnO	CaO	MgO	P_2O_5	Na_2O	K_2O
Jari.....	4.34	78.50	13.16	0.46	0.52	1.29	0.26	..	0.97	0.81
Okubo.....	5.14	71.43	17.83	0.55	..	1.87	0.79	0.46	1.27	0.90

S. KONDO

39. The ceramic materials in Saga prefecture. K. IHARA. *J. Jap. Cer. Assoc.*, **353,** 3–15(1922).—A detailed geological survey of the districts producing raw materials of pottery is given. Izumiyama which was found about 300 years ago by S. Li and since has been used as the chief raw material of famous Arita porcelain is a decomposed liparite. The liparite is composed of fine-grained feldspar and quartz, the former being kaolinized markedly; it has sometimes minute iron pyrites and is silicified in part by fine veins of chalcedony. The presence of alum in some of the cleavages and the strong smell of sulphur in the mine indicate that the decompn. of its feldspar has been caused by the actions of sulphurous gas and hot spring. It is classified to 4 kinds; the best one has a compn. of 3.12% loss on ignition, 76.07% silica, 14.11% alumina, 0.88% ferric oxide, 1.97% lime, traces of manganous oxide and magnesia, 0.15% titanium dioxide, 2.67% potash and 1.36% soda. Some other liparites have probably been decomposed by weathering. S. KONDO

40. Report on clay resources for Soma wares. S. NÔTOMI. *Geological Survey, Bull.* **67.**—Geology of the region surrounding the village of Obori where the Soma stone-ware are manufd. is described. The clayey stratum of the region has probably formed by the deposition of weathered gneiss and granitic sandstone and is composed of granitic sand and kaolin. It contains also remarkable propn. of peat. S. KONDO

41. Feldspar deposits of the Ottawa District. N. B. DAVIS. *Can. Min. Jour.*, **43,** 521(1922).—Mr. Davis gives history of the deposits, and the work done on development of same; the character of the feldspar; its analyses; the method of its mining; and illustrations of the quarries and pits. O. P. R. O.

42. Barium in Canada. H. S. SPENCE. *Rept. Mines Branch,* Dept. of Mines, Canada, 1922.—This rept. gives history of baryte mining in Canada: occurrences and character of Canadian barytes; describes methods of mining and milling; gives analyses, production, exports and imports; includes the production of barytes in other countries; gives principal consumers in the U. S.; gives a general outline of process through which crude barytes pass in the prepn. of ground barytes for the trade. O. P. R. O.

43. Pottery clays in Canada. J. KEELE. *Mineral Resources of Canada,* Mines Branch, Dept. of Mines, Canada, 1922.—Describes the different types of pottery and the clays required by each. Glacial lake and estuarine clays widely distributed throughout Canada are used for the manuf. of common brick and drain tile; not suitable for pottery in their natural state. Stoneware clays are sparingly distributed in Canada and are accessible for present use in Nova Scotia and Saskatchewan only. No ball clays are found in Canada, except among the white clays of Saskatchewan. The only white burning kaolin found in Canada is in Quebec. The only known deposits of stoneware and fire clay occur in Ontario, but beyond the reach of transportation. Saskatchewan is the only region in Canada where valuable clays occur in abundance, suitable for various kinds of pottery. O. P. R. O.

44. Strontium in Canada. H. S. SPENCE. Mines Branch, Dept. of Mines, Canada, 1922.—Two commercial sources of strontium are celestite (Strontium sulphate), and strontianite (strontium carbonate). Celestite is by far the more common and most largely used in the production of strontium salts. Four occurrences of celestite of economic importance are known, all of them in Ontario. Celestite is white, cream-colored or bluish and occurs in tabular crystals, and in aggregates of fibrous or columnar crystals. Its hardness is 3 to 3.5, being lighter than barytes; sp. gr. is 3.9. Pure celestite contains 56.4% strontia and 43.6% sulphur trioxide. It is readily distinguished

from barytes by flame test. The chief sources of the world's supply of celestite are England and Sicily. Strontianite is more valuable since it is readily sol. in acids. Weight for wt., it contains 70.3% strontia but most strontianites have a portion of their strontia replaced by lime. Strontianite commands a higher market price than celestite and is a relatively rare mineral occurring in economic quantities very rarely. Prussia is the most important source; occurs as a gangue mineral in Germany and Scotland; found in California in the form of irregular masses of clay. The chief use of strontium is as strontium hydrate in the beet sugar industry; also used to make "red fire" signal flares; also for medicine. Strontium carbonate is used in iridescent glass and for hardening copper castings. Celestite has been employed as substitute for barytes as a filler and in the manuf. of lithopone. O. P. R. O.

45. Process for the extraction of alumina and its salts from clay. H. G. WILDMAN. *Quarry, Surv. and Contractors' Jour.*, **27,** 233(1922).—The clay, preferably china clay, is boiled in alk. soln. made of boiling soda ash with an insufficient quantity of lime to convert all the carbonate to hydrate, 30 lbs. soda to 100 lbs. clay. The liquid is drawn off after settling and sodium carbonate and sodium hydrate added, after which the soln. is again ready for use. The clay is agitated in cold water and treated with sulphur dioxide from burning pyrites or sulphur under pressure until all absorption ceases. The mixt. is filter-pressed, obtaining pptd. silica and the filtrate passed into a second digester fitted with closed steam coils and a vacuum pump. On heating, the higher sulphides of aluminium are decomposed, giving up the sulphur dioxide in soln., the gas is removed by the pump and recovered. The aluminium is pptd. and ignited to recover the sulphur dioxide. O. P. R. O.

46. The surface tension of colloidal solutions. HEDWIG SCHLEIFFER. *Kolloid Z.*, **30,** 273–8(1922).—The surface tension at different temps. was detd. for a number of colloidal solns. in H_2O. Azobenzene, myristic acid, mastic and gum arabic were found to lower the surface tension of the dispersion medium but gamboge and hydrous Al_2O_3 did not affect it. The temp. coeff. of the colloids was almost identical with that of H_2O. Investigation showed that neither the viscosity nor the vapor tension of H_2O was changed by the presence of the suspended particles, indicating that little or no soln. took place. HARRY B. WEISER (*C. A.*)

47. Variations in the conductance of solid electrolytes. P. VAILLANT. *J. phys. radium*, **3,** 87–100(1922); cf. *C. A.*, **15,** 987.—When a solid electrolyte such as CaS is placed between metal electrodes and a voltage applied, polarization takes place and finally after some hours reaches an equil. value. If the temp. is suddenly changed the cond. undergoes 2 changes, one almost instantaneous, the other slow. The first effect is an exponential function of the abs. temp. The second effect is manifested in a series of oscillations of which the final effect is an increase or decrease in cond. depending upon whether the temp. has been lowered or raised. The increase or decrease is more rapid as the temp. change is greater. C. R. PARK (*C. A.*)

48. Capillarity. I. Some general considerations and a discussion of methods for the measurement of interfacial tension. A. FERGUSON. *Trans. Faraday Soc.*, **17,** 370–83(1922).—No data are given. Twenty methods for *measuring surface tension* are mentioned. Of these methods, capillary rise, pendant drop, or bubble, and sessile drop are mathematically analyzed. The surface tension of solids may be detd. either by change of soly. with size of particle, or change of vapor pressure with change of size of the particles considered. **II. A modification of the capillary-tube method for the measurement of surface tension.** A. FERGUSON AND P. E. DOWSON. *Ibid.*, 384–91. —The modification described consists in measuring the total pressure "p_a" above a meniscus in a capillary tube immersed in the liquid whose surface tension is to be detd. $p_a = P + g_\rho h + (2T/R)$. P is the atm. pressure; ρ, the density; h, the depression

of the meniscus below the surface of the liquid; T, the surface tension; and R, the radius of curvature at the vertex of the meniscus. The surface tension of benzene was found to be 29.58 dyne-cm.$^{-1}$ at 15°. Benzene is not considered a good standard liquid, for it showed a surface tension of 29.6 dyne-cm.$^{-1}$ after careful purifying and additional crystn., and the same samples after a few days showed a surface tension of 29.9 dyne-cm.$^{-1}$ F. E. Brown (*C. A.*)

49. Rapid tests for copper in pyrite and iron minerals. A. Braly. *Bull. soc. franç. minéral.*, **44**, 119–21(1921).—A content of Cu as low as 0.7% is revealed by the red coloration of a $NaPO_3$ bead, heated in the reducing flame with the addition of SnO; smaller amts. by the characteristic blue flame color, obtained by roasting the powdered mineral on a mica support, adding HCl, and evapg. Edw. F. Holden (*C. A.*)

50. Clays as dispersed systems. Sven Odén. *Trans. Faraday Soc.*, **17**, 327–48 (1922).—No given chemical component is necessary, in order to classify a soil as a clay. A soil layer is a clay, a silt or a sand soil according to whether the greatest part falls within the limits for clay, loam, or sand. These limits are detd. by size of particles. Clays are disperse formations of mineral fragments in which particles of smaller dimensions than 2 μ predominate. Odén detd. the distribution of sizes of particles by collecting the particles settling through a tall cylinder of water on to a plate suspended near the bottom of the cylinder by a fine gold wire. The upper end of the gold wire was attached to the left pan of a balance fitted with an elec. appliance which automatically added successive equal wts. to the right pan when the accumulated sediment equalled the wts. already added. A second device recorded the time at which each wt. was added. The formula for calcg. the effective radius r of the particles is, $r = \sqrt[3]{(3/4\pi)\ (vp/sn)}$ in which v is the vol. in cm^3., p the number of g. of suspension per cm^3., s the sp. gr. (always taken as 2.7) and n, the number of particles in volume v. The method for applying this equation to a soil suspension is shown. By using suspending media having different densities and viscosities practicable rates of deposition of sediments from the finest particles up to those 50 μ in radius are possible. F. E. Brown (*C. A.*)

51. New uses for zirconium. R. E. Kirchner. *Chem. Ztg.*, **46**, 380(1922).—Large deposits of zircon in South America and Mexico make this substance of potential importance. It has been used as an abrasive, in making "siloxyd" glass (superior to quartz glass because not sensitive to the action of oxides of the heavy metals), etc. ZrO_2 is the best elec. insulator at high temps., *e. g.*, 2000°. It can be used for making refractories, enamels, coloring porcelain dark violet, prepg. high-grade steels, and jackets for electric furnaces. Zr can be employed as a substitute for Pt for many purposes, especially in chem. labs. Its carbide might replace the diamond for cutting tools in the glass industry. W. C. Ebaugh (*C. A.*)

52. The solubility of small particles and the stability of colloids. L. F. Knapp. *Trans. Faraday Soc.*, **17**, 457–65(1922).—In the presence of an excess of the substance of which the disperse phase is composed, colloidal particles are uniform in size. This is due to the fact that the soly. of particles of this size is the same as the soly. of the large undispersed body. This soly. is due to the combined effect of surface tension and the elec. charge on the surface of the particle. An equation is derived for the value of r the "critical" radius of such suspended particles. $r = \sqrt[4]{q^2d/8\pi K\sigma}$ in which q is the elec. charge on a particle, d the distance between the double elec. layers (Helmholtz), K the dielec. const. of the dispersion medium and σ the interfacial tension between the suspended particle and the dispersion medium. AgBr pptd. in gelatin forms in various small-sized particles. But after 40 min. heating the grains are uniform and larger than the largest particles first formed. To explain this increase in size one must assume either that the charging of the particle is a gradual process of adsorbing ions, or that the complete pptn. of the AgBr is delayed by the gelatin. In this case

there is no plane surface so the final size must be the size of minimum soly. The article is largely mathematical. F. E. BROWN (*C. A.*)

53. Notes on the preparation of some fluorescent and phosphorescent compounds. W. S. ANDREWS. *Am. Mineral.*, **7**, 19–23(1922).—Detailed directions are given for prepg. in a condition such as to exhibit max. luminescence the compds. Zn_2SiO_4, $Cd_3(PO_4)_2$, $(Cd, Zn)_3(PO_4)_2$, and ZnS, all contg. Mn as a necessary impurity; pure $Cd(OH)(PO_4)$, $CdSO_4$ and $ZnSO_4$; and a fluoride contg. some NH_4F. E. T. WHERRY (*C. A.*)

Refractories and Furnaces

54. Burning ceramic products in electrically heated furnaces. ALBERT GRANGER. *Compt. rend.*, **175**, 98–100(1922).—Pieces were burned in a platinum ribbon resistance furnace and in a granular carbon resistance fur., of lab. types. The latter was built around a horizontal clay-bonded corundum tube, 66 cm. long and 10 cm. in diam. The impure corundum was obtained from the alumino-thermal process of making metallic chromium, and was purified by treating with sulfuric and hydrochloric acids. In the platinum fur. due to the continued oxidizing conditions light-colored burned pieces were easily obtained. In the carbon resistance furnace a porcelain body turned out greyish, a condition that is met with in commercial kilns when the atm. is too reducing. The grey color would then be explained as being due to the occlusion by the glaze of finely divided carbon, which has not been burned and is being carried by the flame. In the present case there was no flame to carry the carbon. The corundum tube, however, was porous enough to allow gases to pass through. Carbon monoxide passed through the cylinder, and burned at the mouth of the tube when opened to the air. By allowing a good draft to pass through the tube the trouble from darkening of the pieces was obviated. It is assumed that the carbon which colored the porcelain in the carbon resistance furnace came from the deposition of carbon from the decompn. of the gas: $2CO = CO_2 + C$. LOUIS NAVIAS

55. Refractory cements and protective coatings. C. E. BALES. *Clayworker*, **78**, 140(1922).—B. discusses the effect of substances most commonly added to fire clay and their effect. Common salt, sand, cement, water glass, lime, and asbestos decrease the refractoriness of fire clays while fire clay grog increases the refractoriness. Carborundum dust mixed to a pasty consistency with water, makes a very good protective coating but it does not add a great deal to the life of the refractory. H. G. SCHURECHT

56. Eleven year oil burning experience. M. TAYLOR. *Brick & Clay Record*, **61**, 246–7(1922).—The Vincent Clay Products Co., drain tile manufs. of Ft. Dodge, Ia., operate an 18-chamber Goldner patent kiln of the Youngren type. Each chamber is fired from the top through a series of 11 fire holes. These are spaced $3^1/_2$ ft. apart along the side of the chamber, and the flame impinges on brick fire boxes which are built into the flash wall. Only 2 firemen are necessary; there are no unsightly piles of coal or ashes and the ware is free from scum. Before making a change from coal to oil it is well to consider the following items: (1) A careful comparison of the actual operating costs of fuel oil *versus* coal, as estimated for the particular locality in question, (2) the advantages in favor of oil that can not be estd. in money, such as, clean yards, no coal or ashes, increased quality, better satisfied and more efficient burners, (3) a decision should be made as to whether the high pressure or low pressure air system would give best results and (4) the cost of installation. Formulas for fuel comparison:

$$\text{For coal } C = \frac{A}{2000\ B}$$

$$\text{For fuel oil} = \frac{D}{E\ F\ G}$$

A = Cost of a ton of coal delivered at the point of use
B = B.t.u. per lb. of coal
C = Av. cost of each B.t.u. in the coal
D = Cost of a bbl. of fuel oil delivered at the point of use
E = B.t.u. per lb. of oil
F = No. of lbs. of oil to the gal.
G = No. gals. to the bbl.
H = Av. cost of each B.t.u. of oil

In comparing the costs for any two fuels the costs of operation and the investment must be taken into account in addition to the difference in fuel value. The av. efficiency of coal is 60% and that of fuel oil is 70% and this must be taken into consideration. H. G. SCHURECHT

57. An oil gas compensating tunnel kiln. ANON. *Brit. Clayworker* (1922); *Céramique*, **25**, 198–9(1922).—A tunnel kiln with two tunnels side by side is described. The cars run in opposite directions in each of the tunnels and in this manner the waste heat is better utilized. H. G. SCHURECHT

58. Knacks in setting up-draft kilns. E. PETTS. *Brick & Clay Record*, **61**, 211–42 (1922).—Detailed directions are given on setting and firing up-draft kilns. H. G. SCHURECHT

59. Resistance tests on refractory products under load at different temperatures. V. BODIN. *Trans. Ceram. Soc.* (Eng.), **21**, 56–65(1921–22).—See *Jour. Amer. Ceram. Soc.*, **4**, 69(1921). H. F. S.

60. Notes on American practice in refractories. W. J. REES. F. I. C. *Trans. Ceram. Soc.* (Eng.), **21**, 69–88.—An excellent general description, laying emphasis on efficient plant lay-out and the use of labor-saving machinery. H. F. S.

61. Load tests on refractory bodies at high temperatures. E. SIEURIN, F. CARLSSON AND B. KJELLGREN. *Ber. der. Deut. Keram. Gesellschaft*, **3**, Pt. 2, 53–64(1922).—The softening temp. under press. of a fire-clay body mixed with varying amts. of SiO_2, Al_2O_3, Fe_2O_3, CaO and MgO, were detd. in a carbon resistance furnace. The clay had a soft. temp. of 1280°C and a m. p. of 1750°C. Small additions of Fe_2O_3, CaO and MgO lowered the soft. pt. rapidly. When the SiO_2 content was increased, a min. soft. pt. was reached between 60–70% SiO_2, although the lowest m. p. was at 90% SiO_2. With Al_2O_3 the max. soft. pt. was at 80% Al_2O_3. Seven graphs are given to show the effect of the added materials upon both the soft. pt. and m. p. The soft. pt. of good SiO_2 brick is 1650°C and of carborundum brick, 1800°C, the soft. pt. being taken when a linear shrinkage of 0.3% results under a press. of 2 kg./cm². E. N. BUNTING

62. On tunnel kilns. S. MOMOKI. *J. Jap. Cer. Assoc.*, **347**, 385–91(1921).—Although small tunnel kilns have been used for over-glaze coloring more than 10 years in Japan, Mr. K. Okura, president of the Toyo-Toki Co., was the pioneer in adopting large tunnel kiln for hard firing. In August, 1920, a Dressler tunnel kiln was completed at their factory. The result of seven-months' expt. was quite satisfactory. As to the saving in fuel, 315 lbs. of second-class lump coal of Kyushu were required for heating one car load of sanitary ware, measuring 70 cu. ft., to cone 6, while 6-m. round kilns of English style consumed 875 lbs. of the same coal in firing the equal vol. of saggers to the same temp. Conclusions are (1) that the building cost of a tunnel kiln is about 3 times as much as round kilns of same capacity, (2) that the kiln house for round kilns costs 2 times as much, for faience, and $2^1/_2$ times as much for porcelain as tunnel kiln, (3) round kilns require about double space, compared with tunnel kiln, for faience, whereas the ratio is just reversed in porcelain works and (4) also that the excess of fixed capital in the erection of tunnel kiln is cancelled by its general advantages, and accordingly it reduces the cost of production by the saving in fuel and the utilization of waste heat. S. KONDO

63. Investigation of refractory materials: the after-contraction test. D. A. JONES. *Quarry, Surv. and Contractors' Jour.*, 27–143(1922).—A preliminary rept. of work carried out under the auspices of the Joint Refractory Materials Committee of the Institution of Gas Engineers and the Society of British Gas Industries. Tests were made on the whole brick instead of smaller pieces. Two measurements were taken along the length, two along the width of the brick face, and the mean of each pair of readings taken. The temp. was raised over a period of 4 hrs., maintained at cone 14 for fire brick and cone 12 for silica brick; for a further period of 2 hrs. they are heated in a combustion fur. oxidizing atm. The chief source of error due to dislocation of surface of brick is that the calipers measure not only the change in length but also this indefinite surface change.
O. P. R. O.

64. Report of the Refractory Materials Research Committee. A. E. BROADBERRY. *Gas World,* **76,** 553–9; *Gas J.*, **158,** 840–52(1922); cf. *C. A.* **15,** 3377.—Reference is made to the need for improvement of the after-contraction or expansion test as found in the Gas Institution's standard specification for refractory materials of Nov. 1912. In regard to the retort specification (cf. *C. A.* **14,** 2411), it had originally been intended to make the retorts only from fire clay with admixture of grog, but it was now necessary to add Si and siliceous materials, aluminous materials, carborundum, etc., as well as mixts. of them. A new definition of what constitutes *signs of fusion* was suggested as being that condition "when the angular edges of the test piece begin to lose their angularity when heated under conditions stated." The contraction test had also proved difficult to carry out, the size specified being too large (4.5 in. sq.). It was now proposed to use smaller test pieces (3.5 x 1.5 to 2 x 1.5 to 2) and to place them vertically instead of horizontally. An endeavor is being made to overcome the difficulty experienced in taking the necessary measurements by allowing a tolerance of 1% for exptl. errors, but the actual allowance for contraction or expansion has been reduced from 1.25% to 1%. **Standardization of the after-contraction test.** D. A. JONES. *Gas World,* **76,** 554; *Gas. J.*, **158,** 840–4; cf. *C. A.* **16,** 808. **Thermal conductivity of refractory materials at high temperatures.** A. T. GREEN. *Gas World,* **76,** 554–8; **77,** No. 1980 (Coking Sec.), 13–18; *Gas J.*, **158,** 844–51.—The report is unsuitable for abstracting; the results being expressed mostly in tabular form. Previous work on the subject is reviewed. As regards the relationship between porosity and thermal cond., results of the expts. suggest that at high temps. (1400–1500°) some of the pore spaces lose their insulating properties, and even at 1100° have the capacity for transmitting heat at rates comparable with the solid matter. Diffusivity is indicated as being the measure of the rate of rise of temp. produced in a material. It varies with temp. in a manner similar to that of thermal cond., and in carbonizing its measurement would form a satisfactory criterion of the thermal efficiency of the material, while in furnace work where insulation is desirable, the measurement of thermal cond. would be more satisfactory.
J. L. WILEY (*C. A.*)

65. Electric steel plant at the Southern Pacific shops. L. J. BARTON. *Chem. Met. Eng.*, **26,** 838–40(1922).—A steel-making plant comprizing a 6-ton Heroult elec. furnace with equipment for making ingots and castings is described. The installation of the elec. furnace was made after a careful comparison of cupolas and converters, open-hearth and elec. furnaces for working up the available scrap. The elec. furnace was selected as the most suitable on the basis of the superior quality of elec. steel, a slight advantage in cost of the finished steel, and the adaptability of the elec. furnace to a wide variety of products. The basic process was chosen since the available scrap was high in S and P on account of large quantities of wrought Fe mixed with it. Operation of the furnace follows the standard 2-slag process. Data from 2 years' continuous operation show an av. power consumption of 565 kw. hr. per ton of charge; electrode consumption

of 30 lb. of carbon or 12 of graphite per ton of product. The bottom of dead-burned magnesite is still in good condition after 2 years of const. operation. This furnace has been used in the production of rivet steel, tie plate steel, steel castings, and synthetic cast Fe. LOUIS JORDAN (*C. A.*)

PATENTS

66. Rotating kiln for burning cement. NILS WINQVIST. Sweden 1,415,970, May 16, 1922. A rotary kiln having a preparatory heating zone, and flat projections extending from the wall of the zone and leaving a free central passage in the kiln, the projections being spaced longitudinally and circumferentially of the kiln and having large surfaces parallel to the direction of rotation and presenting thin edges and open spaces to the material in the direction of rotation, thereby to prevent lifting of the material by the projections during rotation. C. M. S., JR.

67. Rotary kiln. ALEXANDER B. CARSTENS. Mexico 1,415,990, May 16, 1922. A rotary kiln having openings intermediate the ends thereof, means for normally closing the openings during substantially a complete revolution of the kiln to prevent the escape of gases therefrom, and means coöperating with the first-named means to cause a momentary opening of the same, thereby permitting material to pass through the openings into the kiln. C. M. S., JR.

68. Kiln. RICHARD K. MEADE. U. S. 1,416,657, May 16, 1922. In a kiln for burning lime or the like the combination of an upright ore chamber, a coal burning fur. at the bottom of the chamber connected to the ore chamber so the latter acts as a stack, a stoking grate in the furnace composed of rocking sections and a drop bar means for operating the stoking grate outside the fur., hopper feeding means for supplying the fuel to the grate, the bottom of the kiln and the fur. being closed normally and during stoking to prevent the admission of excess air to the kiln. C. M. S., JR.

69. Electric furnaces. V. M. SAUVAGEON. Can. 219,805, June 20, 1922. A resistance furnace heating by radiation through the crown has the space above the crown filled with a resistance material. The crown and walls of the furnace are composed of a good conductor of heat which becomes an electric conductor at high temp. See *Ceram. Abs.*, **1**, 236(1922). (*C. A.*)

70. Electric furnace adapted for refining metals. H. DE NOLLY. U. S. 1,417,303, May 23. (*C. A.*)

71. Electrode furnaces. W. DYRSSEN. Can. 219,975, June 20, 1922. The electrodes are arranged in the furnace in a common counterbalanced system, one counterbalancing another. (*C. A.*)

72. Induction furnace having uni-directional circulation. J. R. WYATT. Can. 219,098. Beneath the furnace chamber and connected therewith is a resistor channel, of restricted cross-section in one part, for molten metal, in combination with an a. c. transformer having one leg threaded through the channel. The leg is nearer the metal at the more constricted part of the channel than other parts thereof. (*C. A.*)

73. Refractory material. WM. A. FRANCE. Can. 219,609, June 13, 1922. A small amt. of molten $MgCl_2$ is mixed with burned magnesite, the mixt. is moistened, then molded and pressed into the desired shape and allowed to dry without burning. (*C. A.*)

74. Electric furnace regulator system. C. A. BODDIE. Can. 219,625, June 13, 1922. The system comprizes an adjustable electrode operated by a motor, switches for controlling the direction of rotation of the motor, a main control electromagnet operated in accordance with the current passing through the furnace for selectively operating the switches and means controlled by the switches for directly varying the energization of the main control magnet in accordance with the switch operated. (*C. A.*)

75. Electric furnace regulator systems. C. A. BODDIE. Can. 219,624, June 13,

1922. The system has an electromagnet controlled in accordance with the current of the arc and a second magnet controlled in accordance with the voltage across the arc, both magnets coöperating to govern the same contact members which govern reversing switches for an electrode motor. The reversing switches govern elements for varying the energization of the electromagnets in order to prevent hunting action. Means are also provided for establishing a dynamic braking circuit for the electrode motor. (*C. A.*)

76. Abrasive and refractory articles. A. H. Anderson. Can. 219,646, June 13, 1922. A compn. for forming ceramic articles contains refractory or abrasive cryst. grains, a plastic clay, water and an oily lubricating agent. Cf. *Jour. Amer. Ceram. Soc.*, **4**, 241(1921).

77. Tilting electric furnace. W. Dyrssen. U. S. 1,416,699, May 23. (*C. A.*)

78. Refractory composition. C. A. French. U. S. 1,418,372, June 6. Zr oxide and steatite are used together to form a compn. adapted for crucibles, furnace linings or spark plug insulators. (*C. A.*)

79. Refractory material. R. W. Hull. U. S. 1,418,648, June 6. A refractory material adapted for lining furnaces is formed of the residue remaining from the concn. of Cr ore contg. a mixt. of SiO_2, serpentine and olivine, united by a binder such as pitch, tar or Al_2O_3. (*C. A.*)

BOOK

80. The electric furnace in the iron foundry. Lyman C. Judson and Harry P. Martin. *Trans. Am. Electrochem. Soc.*, **41**, advance copy (1922).—A bibliography, briefly abstracting each reference. Louis Jordan (*C. A.*)

Stoneware, White Ware and Porcelain

81. The firing of porcelain in tunnel- and round-kilns. E. Reutlinger. *Ber. der Deut. Keram. Gesellschaft*, **3**, Pt. 3, 121–46(1922).—From exhaustive expts. the best firing curves have been developed, showing the course of the temp. and the analysis of the flue gases. The present practice of many burners, to keep all parts of the kiln at the same temp., or to produce a reducing atmosphere, causes a waste of fuel either through too large an excess of air or of unburned gases. By using the recommended firing schedules a good burn with respect to fuel consumption, time of burn, and yield is obtained. The necessary measuring instruments must be installed and the burner taught to use them. The use of control methods does not necessitate a radical change in the usual practice, but allows the burner to know at all times the condition of the kiln. Although the expense of control instruments is fairly large it is justified by the saving in fuel, better yields, and independence from experienced burners. E. N. Bunting

82. The transparency of porcelain. W. Steger. *Ber. der Deut. Keram. Gesellschaft*, **3**, Pt. 2, 50–3(1922).—The influence of sand, quartz, and geyserite upon the transparency of porcelain was detd. A body contg. 30% Norwegian quartz, 40% kaolin, 30% feldspar, burned to cone 15, is 3 times as transparent as a similar body contg. Hohenbockaer sand or Taunus geyserite. When the kaolin content is 50%, feldspar 25%, Nor. quartz 25%, the transparency is twice that of a similar body contg. the sand, and 4 times that contg. the geyserite. E. N. Bunting

83. Chromatics and its application to painting porcelain. W. Funk. *Ber. der Deut. Keram. Gesellschaft*, **3**, Pt. 2, 77–86(1922).—This is an address delivered before a meeting of the Ger. Ceram. Soc. in which the author defends the esthetics of color, developed by Ostwald, as applied to the decoration of porcelain. See *Jour. Amer. Ceram. Soc.*, **4**, 247(1921). Normal colors and harmony of colors. W. Ostwald. *Ibid.*, **4**, 780(1922). Fundamentals of theory of color measurement. W. Ostwald. E. N. Bunting

84. The latest literature on the "lead question." P. BARTEL. *Ber. der Deut. Keram. Gesellschaft,* **3,** Pt. 2, 86–108(1922).—The literature later than 1912 concerning lead compds. is reviewed under the headings (1) Laws and regulations. (2) Transactions and discussions in meetings, congresses, and parliaments. (3) Hygienics (publications of physicians, etc.). (4) Technical (research and practical expts. with lead glazes). E. N. BUNTING

85. Zirconium fluoride glazes. F. KRAZE. *Ber. der Deut. Keram. Gesellschaft,* **3,** Pt. 3, 157–61(1922).—The following formulae give good turbid white glazes maturing at cone 05a, applicable to either porous pot ware or iron ware:

(1)	0.735 Na_2O		3.007 SiO_2	(2)	0.728 Na_2O		
	0.214 K_2O	0.234 Al_2O_3			0.234 K_2O	0.301 Al_2O_3	3.161 SiO_2
	0.051 BaO		0.184 ZrF_4		0.029 BaO	0.035 Al_2F_6	0.061 ZrF_4

The frit must be kept molten until all SiF_4 escapes. Before grinding the frit, 0.020 kaolin is added to (1) and 0.058 to (2). Raw materials used are quartz, soda, potash feldspar, barium peroxide, sodium fluosilicate, cryolite, and zirconium silicate.

E. N. BUNTING

86. On the ratio of Al_2O_3 and SiO_2 to RO in porcelain glazes, fired at high temperatures. Y. KITAMURA. *J. Ind. Chem. Tokio,* **2,** 89–102(1921).—The research was carried out with a view to study the effect of the variation in the ratio of alumina and silica to bases on the physical properties of hard porcelain glazes and therefrom to find the best ratios for various temps. The range of compn. of glaze was RO, 0.2–2.2 Al_2O_3, 4–26 SiO_2, where RO is 0.5 KNaO, 0.5 CaO in one series and 0.1 KNaO, 0.9 CaO in the other. Glaze was applied on 3 different biscuit bodies and burned to cones 11, 14 and 17. The results are shown with 6 diagrams, plotting alumina as ordinate and silica as abscissa. Conclusions: (1) The area within which glazes have marketable lustre and also the area wherein glazes are undermatured but have at least a slight lustre are elliptic. (2) The lustre-area expands as firing temp. rises; at the same time, the centre moves in the opposite direction to the origin of axes. (3) Glaze at the centre of lustre-area is probably the best one. Thus, the compns. of the best glazes have been calcd.

TABLE I

CHEMICAL FORMULAS OF THE BEST GLAZES

Firing temp. (Seger cone)	RO = 0.5 KNaO, 0.5 CaO	RO = 0.1 KNaO, 0.9 CaO
11	RO, $0.9Al_2O_3$, $8SiO_2$	RO, $0.7Al_2O_3$, $6.0SiO_2$
14	RO, $1.05Al_2O_3$, $10SiO_2$	RO, $0.95Al_2O_3$, $9.5SiO_2$
17	RO, $1.1Al_2O_3$, $15SiO_2$	RO, $1.1Al_2O_3$, $14.5SiO_2$

(4) Extending the result, glazes for intermediate temps. and other different RO can be calcd. Two examples are given:

TABLE II

CALCULATED FORMULAS OF GOOD GLAZES, HAVING 0.1KNaO, 0.9CaO AS RO

Firing temp. (Seger cone)	RO	Alumina	Silica	Firing temp. (Seger cone)	RO	Alumina	Silica
11	1	0.70	6.0	15	1	1.01	11.0
12	1	0.80	7.0	16	1	1.06	12.7
13	1	0.88	8.2	17	1	1.10	14.5
14	1	0.95	9.5	..	.	..	..

TABLE III

CALCULATED FORMULAS OF GOOD GLAZES, HAVING 0.3KNaO, 0.7CaO as RO

Firing temp.	RO	Alumina	Silica	Firing temp.	RO	Alumina	Silica
11	1	0.80	7.0	15	1	1.05	11.2
12	1	0.87	7.7	16	1	1.08	12.8
13	1	0.94	8.6	17	1	1.10	14.7
14	1	1.00	9.8	..	.	..	..

(5) Along the major axis of lustre-area which has been named "Lustre Axis," silica varies proportionally with alumina. The ratio is 0.1 Al_2O_3: 1.0 SiO_2 except when glazes, with 0.1KNaO, 0.9CaO as RO, are burned at cone 11; in this case, the ratio is 0.1 Al_2O_3: 0.8 SiO_2. (6) The max. amts. of alumina and silica in the lustre-area are as follows:

Firing temp. (Seger cone)	RO = 0.5 KNaO, 0.5 CaO	RO = 0.1KNaO, 0.9 CaO
11	$1.3Al_2O_3$, $12SiO_2$	$1.1Al_2O_3$, $9SiO_2$
14	$1.5Al_2O_3$, $15SiO_2$	$1.5Al_2O_3$, $15SiO_2$
17	$1.9Al_2O_3$, $23SiO_2$	$1.9Al_2O_3$, $23SiO_2$

(7) Some of the glazes in lustre-area have crazed. Member at the center and those around it are safe while those near the boundary and, moreover, poor in alumina have tendency to craze. S. KONDO

87. How to prevent smoke from pottery kilns. S. MOMOKI. *J. Jap. Cer. Assoc.*, **349**, 474–80(1921).—A social question is now arising on the subject in some districts of the country. The author has long been investigating various methods of preventing smoke from kilns firing faience and porcelain. They are discussed in detail: (1) Elec. pptn. is too expensive; (2) use of pulverized coal is probably injurious, as the best domestic coals contain 10–20% of ash; (3) firing with heavy oil is too expensive; (4) expt. with Kraft's mechanical stoker has shown good result for faience, fired at cone 7; but the need of even-grained coal and the excessive burning-out of metallic parts make its use for hard-fire porcelain doubtful; (5) methods of consuming flue gases by the introduction of hot secondary air, such as P. A. F. Schultz's patent, are promising; but their application to old kilns is expensive or inconvenient; (6) gas firing with pressure-gas producer is probably better than the methods described above; (7) use of tunnel kilns is most promising; but gas firing and the use of tunnel kiln need ample space of which some factories are devoid. S. KONDO

88. Canadian feldspar quarries. EDITORIAL. *Can. Min. Jour.*, **43**, 515(1922).—This article makes special mention of the host of small feldspar quarries throughout Ontario and Quebec. O. P. R. O.

89. A china clay mine. ANON. *Can. Min. Jour.*, **43**, 523(1922).—Description of mine and mill of the Canadian China Clay Co. at Huberdeau, Quebec. The history of the company and the development work done is given; the geology, origin, character and size of deposits given; plant described; analyses of clay given and flow sheet of mill. O. P. R. O.

90. New uses for china clay. ANON. *London Times Trade Supp.*, **10**, 214(1922).—Colloidal clay is produced by chem. processes from china clay. It is a highly refined and purified material which commands lbs. per T. more than ordinary china clay. The production of this clay is arousing interest in china clay circles. O. P. R. O.

91. Electrical porcelain research. M. H. HUNT. *Elec. J.*, **19**, 94–6(1922).—The combined efforts of the elec. engineer, physicist, chemist and ceramist have resulted in the production of elec. porcelain along more scientific lines. A modern lab. is illus. Properties of the ingredients that enter the body, those of the body as a whole, and those of the fired porcelain are considered in evaluating elec. porcelain, in addition to the be-

havior on burning. For the present at least research will be largely cond. on present materials and present general procedures. Standardization of test pieces, app. and tests seems impossible. W. H. BOYNTON (*C. A.*)

92. Mechanical tests for raw materials used in the manufacture of porcelain. W. DEMUTH. *Elektrotechn. Z.*, **43**, 605–10(1922); 15 illus.—A detailed description of the new Hermsdorf lab. and equipment. C. G. F. (*C. A.*)

93. Electrical tests for porosity of electrical porcelain. J. E. SHRADER. *Elec. J.*, **19**, 118–9(1922).—The most important property of elec. porcelain is its dielec. strength, which is in turn indicated by power-factor and resistance. A simple test to det. how moisture absorption affects the latter properties is described. Four insulators of known history were dried overnight at 200° and after cooling filled with Hg and floated in a shallow tray of Hg. The power-factor was measured by a sensitive electrostatic watt-meter and the resistance with a sensitive high-resistance galvanometer. The Hg was then replaced by water and the measurements were immediately repeated. The insulators were allowed to stand in water for 7 days, measurements being made at intervals. Curves for the power-factor of each insulator are shown. Resistance measurements showed that the poorest one had a different moisture absorption. Dielec. tests on these insulators showed that this one punctured at low voltage. Further soaking tests in water and in dye showed that the recorded results are characteristic. The power-factor detn. is very good and a sure indication of moisture absorption which is an indication of the porosity of the porcelain. Resistance measurements only distinguish a good insulator from a poor one. The const. slope of the poor insulator may indicate failure under high potential when sufficient moisture has been absorbed and may be the cause of the deterioration of apparently good insulators on storage or long service. The work shows the direct relation between the power-factor of insulators and their dielec. strength and that barring mechanical troubles or faulty design it depends upon moisture absorption as a result of porosity. W. H. BOYNTON (*C. A.*)

94. Standardization of filter presses. ANON. *Chem. Trade J.*, **70**, 718–9; *Chem. Age* (London) **6**, 788–9(1922).—Report of a joint committee of the Assoc. Brit. Chem. Mfrs. and the Brit. Chem. Plant Mfrs. Assoc. E. H. (*C. A.*)

95. Process of manufacturing granite-porcelain. TOMOTARO KAWAMOTO AND GOSUKE KATO. Japan 40,582, November 9, 1921. A porcelain is made of a body which is prepd. by mixing coarse grains of granite to the other ingredients, *i. e.*, feldspar, quartz, amalgatolite, Kibushi clay, limestone and water. The fired products look like granite. S. KONDO

96. Process of manufacturing talc pottery. KOSUKE HIRANO. Japan 40,963, November 30, 1921. Magnesite, calcined at 600–1200°C, is added to the body materials of talc pottery. In most cases, the talc is previously heated at a high temp. S. KONDO

97. Artificial marble. ARAJIRO HISADA. Japan 38,873, June 11, 1921. Plastic porcelain bodies of different colors are cut to irregular pieces and thrown together in a mold, then the mold is filled with similar body of white or other color and pressed. The shaped body is fired after drying. The surface of the fired product is, sometimes, polished. S. KONDO

98. Process of decorating pottery. KOSABURO KANO. Japan 38,872, June 11, 1921. A design or lettering is printed on paper with a paste composed of glaze 8, orchid-root 1, syrup, sugar or rice-jelly 1 and proper amt. of warm water, then it is transferred on biscuited ware; a hard-fire color is painted on the design or lettering and its neighborhood. The print repels the color and remains uncolored. Now glaze is applied on the whole surface and the ware is fired at high temps. S. KONDO

PATENTS

99. Apparatus for the manufacture of pottery ware. RICHARD H. WAINFORD AND CHARLES H. DARLING. U. S. 1,408,663, March 7, 1922. In apparatus of the class described, the combination of a machine for forming clay and a drying stone having a series of movable ware-boards, means intermediate the machine and the drying stove whereby the movement of the ware-boards is synchronized with the operation of the machine, and means for automatically stopping the operation of the machine at a predetermined stage of its operation. C. M. S., JR.

100. Process of forming clay image. EIZABURO MURAKOSHI. Japan 39,732, August 30, 1921. Clay images, imitating ancient "Haniwa," are formed with plastic clays, using a cloth bag filled with sand as core, which is taken out afterwards by discharging the sand. The images are then fired in a kiln. S. KONDO

101. Process of fixing a tack to an artificial tooth. ISUKE OGAWA. Japan 39,267, July 14, 1921. A vertical slit and a horizontal hole are made so as to meet at a point within a porcelain tooth. After firing at a high temp., a small plate of silver or brass is inserted into the bottom of the slit and a tack of platinoid, gold or nickel into the hole. Then the tooth is heated to the m. p. of the plate to weld it with the end of the tack. S. KONDO

102. Firing earthenware. C. J. KIRK. U. S. 1,418,446, June 6. The articles to be fired are passed through heating zones in which the temps. are independently controlled. (*C. A.*)

Art and Design

103. The constitution of some ceramic coloring materials. R. RIEKE AND W. PAETSCH. *Ber. der Deut. Ceram. Gesellschaft*, **3**, Pt. 3, 147–56(1922).—On heating mixts. of oxides together contg. either Cr_2O_3, Al_2O_3, or Fe_2O_3 as one component, compds. are obtained with the general formula $RO.R_2O_3$. Of these compds., many of which show characteristic colors, the chromites are chem. most stable, and are well suited for underglaze colors. The formation temp. differs for the various compds., being quite low for those contg. ZnO. In contrast to the chromites, the aluminates and ferrites are easily decomposed or dissolved by glazes, depending somewhat on the compn. of the glaze. The chromites are also decomposed by glazes high in PbO and low in clay, part of the Cr_2O_3 going over to chromite. E. N. BUNTING

See Abs. 84.

Heavy Clay Products

104. The laying of wall tile. G. STEINBRECHT. *Keram. Rundschau*, **30**, 287 (1922).—Tiles are molded with oblique grooves on the rear which makes them adhere to the wall better. The ends also are molded at 45°. H. G. SCHURECHT

105. Concrete tile failures in alkali soil. E. V. WILLARD. *Brick & Clay Record*, **61**, 248(1922).—Concrete tile are destroyed by the water in 14 counties of the 22 southwest counties of Minn. The total salt content of soil moisture exceeds 0.01% in each of these cases. H. G. SCHURECHT

106. On plasticity of clays. J. W. MELLOR. *Trans. Ceram. Soc.* (Eng.), **21**, 91–103(1922).—Plasticity enables a clay to change its shape without cracking when subjected to a deforming stress. The elasticity of the wet clay is negligibly small. Clay possesses high binding power when dried and fired, so that the form impressed on the clay is retained more or less persistently. Many definitions of plasticity confuse these two distinct properties and assume that the binding power is implied in the term plasticity. A great many methods for measuring plasticity are based on the binding power of the dried clay. This is not always true. No known property of the dried

clay can be used as an infallible index of plasticity and measurements of plasticity dependent on some property of the dried clay can therefore be dismissed. Plasticity is a mechanical property. Until shown that it is a definite function of some quality such as dye-absorption, viscosity of slip, etc., it can not be assumed without reservations that measurements of these qualities measure plasticity. A modified colloidal hypothesis gives the best working explanation of several properties of clay. The stuff obtained by evapg. the "clear" liquid from ball clay, is a deep, hard, horny mass resembling glue. It adheres to the tongue tenaciously and, like glue, swells enormously when wet with water and shrinks and cracks when dried. Cornish china clay gave about 0.005% and Devonshire ball clays gave about 0.05%. It is doubtful if this product represents all the colloidal matter in these clays. No difference could be detected in the plasticity of the clay from which *l'argile colloide* had been removed. M. is inclined to think that the colloid plays an important part in the drying of clay. H. F. S.

107. The dehydration of dried clays. J. W. MELLOR, N. SINCLAIR AND P. S. DEVEREUX. *Trans. Cer. Soc.* (Eng.), **21,** 104–6.—Finely powdered samples of clay were dried over 25 per cent sulphuric acid, and placed in desiccators containing sulphuric acid of different concentrations at a constant temperature of 25°. The samples were weighed every week until constant. The time occupied was approximately three months. If years were available, possibly more water would be lost by the clay.

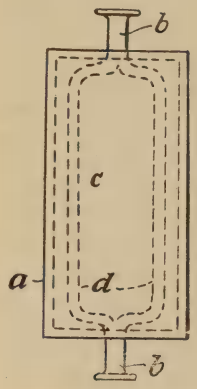
PERCENTAGE LOSS IN WEIGHT ON EXPOSURE OF DIFFERENT CLAYS IN DRIED ATMOSPHERES

Per cent H_2SO_4	Ball clay	China clay	Glenboig clay	Halloysite	Kaolinite	China clay	Halloysite
30	0.08	0.16	0.09	0.10	0.06	0.01	0.06
40	0.24	0.12	0.11	0.41	0.08	0.06	0.44
50	1.63	0.20	0.30	0.93	0.12	0.13	1.67
60	2.31	0.24	0.48	1.84	0.18	0.16	1.96
70	2.44	0.46	0.67	1.92	0.24	0.23	3.26
80	3.29	0.52	1.12	2.37	0.38	0.36	3.62
90	3.54	0.55	1.48	2.58	0.46	0.50	4.05

E. Lowenstein's observations are thus confirmed. Water, combined in clay, is reversible, restored in a moist atmosphere, showing that no drastic change has occurred in the structure of the clay molecule. This change is different from that when water is expelled at higher temps. Resorption of water is so slow that it requires a long time to restore the original plasticity; hence the working qualities, plasticity, shrinkage, etc., of certain troublesome clays can be modified and regulated by dessication. The dried clay like unweathered fire clays requires exposure to moist atmosphere for a long time before the original plastic condition is resumed. The custom of seasoning glass pots for a few months in a warm, dry place may not be so redundant an opern. as might be supposed. Storing of clays in a warm, dry spot is injurious to plasticity. H. F. S.

108. Apparatus for drying bricks, stones, and ores. R. E. COWELL, of Urmston, Eaglescliffe, S. O., Co. Durham; and A. WILKINSON, of Clyde House, Eaglescliffe, S. O., Co. Durham. *Quarry, Surv. Contractors' Jour.* (London), **266,** 27 (1922).—Relates particularly to apparatus for this purpose, in which the material to be dried is spread on trays, heated by passing a heating agent such as steam or hot air into internal passages provided, into the body of the trays. According to the invention, a portable drying floor for drying bricks, stones, and ores, consists in a hollow tray made up of one single piece, casting, sheet, plate, or the like, of iron, concrete, ferro-concrete, or any

other suitable material, adapted to be heated by passing live or exhaust steam, waste hot gases, or any other suitable hot fluid, through the internal passage of the tray, so as to heat it by direct contact with hot fluids or through pipes, perforated or unperforated, led through the space inside the body of the tray, each tray constituting a distinct and separate drying unit. Several such trays may be connected by suitable coupling members to constitute a larger drying floor. A suitable non-conducting material or lagging may be applied externally to the tray or some portions thereof if required. The accompanying drawing shows a hollow tray provided with internal pipes forming two branched circuits. O. P. R. O.



PATENTS

109. Process of manufacturing light brick. KINJI KATADA. Japan 41,372, January 11, 1922. Bricks are formed with a body which is prepd. by mixing and kneading coarse grains of coal-cinder, contg. 25–35% of combustible carbonaceous substances, saw-dust and fire clay. They are afterwards fired in a kiln. S. KONDO

110. Method of making drain tile. P. FUNK. U. S. 1,408,877, March 7, 1922. The method of making drain tile, which consists in puncturing the tile body with a plurality of parallel rows of diagonal perforations, which are laterally parallel to each other, by means of a series of puncturing needles mounted on a common shaft, which is driven reciprocally in a diagonal direction outwardly, in such a manner as to thrust the needles periodically in a slanting direction through the body of the tile while in a plastic condition, and passing from the tile press. C. M. S., JR.

111. Off-bearing mechanism for tile cutters. ALFRED G. HAGUE. U. S. 1,411,492, April 4, 1922. In a device of this kind, spaced pneumatic grippers having means for supporting and moving them from a receiving position to a delivery position, and vice versa, and means for actuating the grippers when in a receiving position to grasp a plastic block, or brick, and to deliver the same when in a delivery position. C. M. S., JR.

112. Brick pallet. LEONARD G. WOODS. U. S. 1,416,432, May 16, 1922. A pallet for supporting bricks before and during the burning thereof, consisting of a sheet metal plate adapted to receive and support the green bricks, the plate being thinly covered with a closely adherent enamel, whereby to prevent sticking of the brick to the plate and reaction of the metal with the constituents of the brick. C. M. S., JR.

113. Hollow building tile. JOHN W. AGER. U. S. 1,414,246, April 25, 1922. A hollow building tile substantially rectangular, having in a rear corner portion thereof transverse and lengthwise intersecting partitions defining with the adjacent ends of the rear and side walls of the tile a substantially rectangular cell, there being weakened fracture lines in the two outer walls of the cell remote from the corner of the tile and so disposed and arranged that by breaking off the rear corner of the tile a jamb block is formed. C. M. S., JR.

114. Machine for manufacturing bricks. SÔTARÔ TAKAHASHI. Jap. 39,444, Aug. 3, 1921. (*C. A.*)

Glass

115. On the nature of the coloring properties of selenium red. A. A. GRANGER. *Trans. Ceram. Soc.* (Eng.), **21**, 89–90(1922).—Cadmium red is a red pigment. Introduced in a suitable flux gives a brilliant and beautiful enamel. Glassmakers produce the same color known as selenium red. Chem. constitution of both cadmium and

selenium red is unknown. Recipes for prepg. selenium red consist essentially of heating materials containing sulphur, selenium and cadmium. Sulphur may be introduced as sulphur, sodium sulphide, sodium hyposulphite or sodium sulphite. The selenium as selenium, sodium selenide or selenite or selenate and the cadmium as oxide, carbonate or sulphide. Success of prepn. does not depend on ratio between ingredients; but chiefly on method of heating and temp. Insufficient heating does not give red coloration; excessive heating produces brown or black. The best method is to heat gently on a wide surface; mixt. slowly stirred and examnd. from time to time when cooling. When hot, the pigment is more brown than when cold. At about 700°C the coloration is subject to alterations. A rapid heating will cause the sulphur to ignite, and after combustion has ceased a beautiful vermilion surface coloration is observed. If the mixt. is brown, some sulphur must be added, the whole being stirred. H. F. S.

116. American made 40-inch telescope disc. DONALD E. SHARP. *Glass Worker*, **41,** No. 45, 9(1922).—The method of making telescope discs is given in some detail. A melt of borosilicate glass was cast in an iron mold lined with fire brick and talc. The disc was annealed in a gas-heated fur., being held 14 days at 464°C. The cooling rate started with 0.2°C per hr. and increased to 6°C per hr. R. J. MONTGOMERY

117. Proper control of pot furnace conditions. HENRY W. HESS. *Glass Worker*, **41,** No. 32, 11(1922).—Discussion of the causes of variation in furnace results due to temperature draft, etc. R. J. MONTGOMERY

118. Glass for laboratory and scientific purposes. ANON. *Schnurpfeil's Review for Glass Works*, **6,** No. 64, 1247(1922).—Alumina is generally used as Al_2O_3 or as the hydrate. Three batches are given: (1) Sand 100, hydrate of alumina 5, soda ash 35, lime 20. (2) Sand 100, hydrate of alumina 6, zinc oxide 1, borax 2, soda ash 35, lime 18. One of fluorspar or sulphate may be added. (3) Sand 100, soda ash 34, hydrate of alumina 6.5, borax 6, lime 18. Alumina may be increased to 8 and borax to 10 and 1 or 2 of magnesia added. Often 1 lb. of saltpetre and .5 lb. arsenic is added to batch to improve melting. R. J. MONTGOMERY

119. Study on the life of pots, used in round pot-furnaces. K. ISHIKAWA. *J. Jap. Cer. Assoc.*, **350,** 519–34(1921).—The study includes elaborate investigations of 810 closed pots with capacity of 600 lbs. of glass and 308 "Japan pots" with capacity of 500 lbs.; it took 4 yrs. Furnaces with direct firing and those with half-gas firing were used; in either case, the flame, after ascending to the combustion chamber and playing around 3 to 6 pots, so arranged as to form a ring, was made to pass through the openings under the mouths of pots. The life averaged 12.0 meltings for covered pots and 9.5 for "Japan pots." 75% of damages in the closed pot were caused by cracking and remaining 25% owed to corrosion. 45.2% of cracks in the closed pots took place on the right and left sides. Different periods in which cracks appeared, the manner of growth of cracks, and the relation between parts of pots and the size of cracks are described. Damages due to corrosion took place chiefly at or near bottom and at the level of metal. Various expts. were done to find the cause of faults in glass of a factory where wares with stone or cord amtd. to 19.09% at that time. Of 19.09%, 3.8% were ascribable to the unskilfulness of workers, 8.4% to the age of pots, 2.2% to corroded rings, 1.76% to corroded stoppers and 0.7% to too coarse sand; thus, only 2.23% were due to unknown causes. Pots with moderate weight had the longest life. Generally speaking, the slower they are dried, the better they wear. The life is also increased by storing the plastic body longer. It depends on season of making and also on the size of grains of raw materials. The position of pots in furnace has remarkable effect. The temp. and duration of heating pots in pot arch are discussed. S. KONDO

120. On the utilization of selenium. S. SUGIE. *J. Jap. Cer. Assoc.* **341,** 152–5; **342,** 193–5; **343,** 226–30(1921).—The chamber-mud of Jap. factories mfg. sulphuric

acid contains 2–6% of selenium. Flue-dust, anode-slime, slag and other by-products of factories treating sulphur or sulphide ores are also rich in the element, as Jap. ores contain more selenium than those of other countries. I. *The recovery of selenium from waste products.* Of many well-known processes of extracting selenium from chamber-mud, anode-slime, flue-dust etc., the following two are recommended: (*a*) Selenium is pptd. by means of concd. hydrochloric acid from soln. of sodium thioselenate which has been obtained by heating the material with soln. of sodium sulphite; and (*b*) selenium in the material is oxidized by heating with concd. nitric acid; then sulphuric acid is added to drive off the excess of nitric acid; selenium is pptd. from the soln. with sulphurous acid gas, sodium sulphite and hydrochloric acid, or hydrogen sulphide. II. *Red pigment of selenium for enamel.* Four kinds of fire-red, imported from Germany before the war, had shown following compns.:

	No. 1	No. 2	No. 3	No. 4
Cadmium	28.2%	24.3%	17.3%	39.1%
Alumina	36.4	53.8	49.4	45.5
Sulphur and selenium	35.4	11.9	33.3	15.4

Starting from the result, many expts. were done, and a new method of mfg. pigments which are as satisfactory as German fire-red has been invented. The method is as follows: mixt. of cadmium sulphide and selenium is heated in a porcelain crucible gradually up to about 500–700°C and the temp. is kept till the content becomes dark brown and the fuming of violet selenium is almost over, stirring the content at times; it is then cooled, still stirring the content; batch-compns. were:

	D	E	G	F	H	A	B	C
Cadmium sulphide	82%	85%	85.5%	86%	86.5%	87%	89%	90%
Selenium	18	15	14.5	14	13.5	13	11	10

The color of the pigments changes continuously from blackish red of D to yellowish red of C. Black shade is also added by heating to higher temps. or heating up rapidly and continuing it longer. For enameling, a coating of transparent frit with 3–5% of the pigment is applied and fired on white coating. Of several frits used for the purpose, one composed of 33 sand, 30 borax, 15 fluorspar, 6 cryolite, 14 sodium carbonate and 2 nitre gave the best results. III. *Use of selenium as pink colorant and decolorizer of glass.* A historical survey on the subject is given. Concluding from many expts. the author says: (1) selenium does not color soda-lime glasses pink, but tends to give them a yellowish brown; (2) selenium, regardless of its sources, colors potash-lime glasses pink; (3) the amt. of selenium required for decoloration is about 1.5% of the amts. of ferric oxide in batches; (4) $CaSeO_3$, $BaSeO_3$ and $PbSeO_3$ are the most effective sources of selenium; (5) the action of selenium is hindered by the presence of oxidizing substances, *e. g.*, red lead; (6) the required amt. of arsenious oxide is about 3 times that of selenium. In either case, it is impossible to get a dark red glass by selenium, as it is volatile at high temps. In general, selenites of alkalies or ammonium are very hygroscopic, therefore they are inconvenient in use. S. KONDO

121. Opal glass and alabaster glass, and their applications. K. FUHA AND Y. YOSHIOKA. *J. Jap. Cer. Assoc.*, **345**, 302–17(1921).—A detailed historical survey and its discussions on the manuf. and theory of opal glass and alabaster glass are given. I. *Experiments.*—The wt. of each batch was 3 kg. for preliminary work, then it was increased to 10 kg., and at last 100–200 kg. batch was taken to manuf. various vessels or lighting goods for trial. Pot was heated by gas or heavy oil, and the temp. in fur. was completely under control. (1) Opal glass. (*a*) Silica or alumina as opacifier. Soda-lime glass, contg. more than 75% of silica, is sometimes devitrified in cooling or annealing. Aluminous hard glass, also, devitrifies in heating repeatedly. (*b*) Fluorine

compds. as opacifier. In this case, glasses composed of 65–68% silica, 9–10% lead oxide, 8–10% alumina, 2–3% lime and 12–14% alkalies were used. The rôle of alumina is to reduce the corrosive action of fluorine compds. on the pot. Introducing varying amts. of fluorine to the glass, it has been found that when feldspar or amalgatolite is used as the source of alumina about 2.5 parts of fluorine per 100 parts of glass is required for the production of opal glass, irrespectively of the kind of fluorine compds. which include fluorspar, sodium fluoride, cryolite, fluorspar and sodium fluoride whereas about 4% of fluorine is required when prepd. alumina is used. (*c*) Bone-ash as opacifier. A deep opal glass was obtained by melting a batch composed of 1200 sand, 800 litharge, 400 potash, 120 nitre, 75 borax, 20 arsenious oxide and 200 bone-ash, but it was translucent in molten state. If we cool the glass to about 800 °C and heat it gradually to 1000–1100 ° and keep at these temperatures, a translucent glass like alabaster will be obtained. Replacing potash with same amt. of soda-ash, no effect was observed. When the amt. of bone-ash was reduced to 150 parts, a translucent glass was obtained; a batch with 100 parts of it gave a transparent one. (2) Alabaster glass. (*a*) With fluorine compds. and auxiliary agents. Since it has been ascertained in the expts. of (1) (*b*), that translucent glasses are obtained by introducing about 2% of fluorine to the said glasses when feldspar or amalgatolite is used, or by introducing about 3.5% of fluorine when alumina is used, these batches have been used as bases. Expts. with these batches to which 0.5–3.0% of various auxiliary agents were added have shown that the introduction of 1.5% or more of strontium or barium sulphate or 3.0% of calcium sulphate gives an alabaster glass. The efforts to use chlorides were useless, but mixts. of sulphate and chloride gave good results. The research resulted in the introduction of "Johga Glass" on market. (*b*) With asbestos. Asbestos batch, such as 1000 sand, 380 potash, 125 litharge, 100 asbestos and 40 nitre, gives a good alabaster glass when it is heated at a constant temp. for a certain time after it begins to melt. Melting at too high temps. makes it transparent. II. *Causes of translucency and opacity.*—(1) Opal glass is produced (*a*) by setting free colloidal silica or alumina from glasses contg. an excess of silica or alumina, (*b*) by similar cause from glasses containing flourine compds., (*c*) or by dispersing calcium phosphate colloidally in a glass. (2) Alabaster glass is produced (*a*) by the suspension of minute particles or colloid of silica or alumina, together with gaseous substances, (*b*) by the suspension of minute substances or crystals of substances other than silica or alumina, *e. g.*, magnesium silicate, together with gaseous substances, (*c*) or by dispersing substances coarsely. Microphotographs are given. Microsections of Johga glasses show innumerable gas-bubbles, ranging from 10 microns to visible size. Physical properties are described, for instance:

TABLE I

	REFLECTION	TRANSMISSION	ABSORPTION	SP. GR.
An ordinary opal glass	70.0%	21.0%	9.0%	..
Johga glass No. 1	36.7	45.0	18.3	2.06
Johga glass No. 2	42.5	49.4	8.1	2.66
Johga glass No. 3	45.5	47.8	6.7	2.52

S. KONDO

122. A note on optical glass. R. SHIBATA. *J. Jap. Cer. Assoc.*, **349**, 481–5(1921). —Descriptions on several specimens of optical glasses which have been manufd. at the naval arsenal, Tokio, their materials, and chief raw materials of pots are given. Process of making pots is explained. S. KONDO

123. Color of glass imparted by iron. K. FUHA. *J. Jap. Cer. Assoc.*, **354**, 39–57 (1922).—Over 1500 different batches were melted to ascertain the effect of variation in the compn. of glass and the influence of oxidizing or reducing agents on the color

of glass imparted by iron. Pure chem. and ground rock-crystals were used. Three formulas were used as bases: (1) R'_2O, $R''O$, $3SiO_2$, (2) R'_2O, $R''O$, $0.5B_2O_3$, $3SiO_2$, and (3) $1.3R'_2O$, $0.7R''O$, $6\ SiO_2$, where R'_2O represents K_2O or Na_2O and $R''O$ represents CaO, MgO, ZnO, BaO or PbO. Glasses belonging to (1) or (2) were melted at 1300–1350°C while those of (3) were melted at 1400–1550°C. The color imparted by ferric oxide is described. Generally speaking, it colors soda glass blue or bluish green and potash glass yellowish green or green. The increase in the colorant adds yellow shade to soda glasses and blue shade to potash glasses. However, there are exceptions where no difference is observable between soda and potash glasses. The difference in $R''O$ affects the color, *e. g.*, ferric oxide imparts dark reddish brown to Na_2O, BaO, $3SiO_2$, light blue to Na_2O, CaO, $3SiO_2$, dull blue to Na_2O, ZnO, $3SiO_2$, and yellowish tint to Na_2O, PbO, $3SiO_2$. Boric acid does not affect the color, although sometimes it darkens or brightens the color. Besides, detailed descriptions are given on (1) the color imparted by ferrous oxide, ferric chloride, ferrous sulphate, ferrous carbonate or ferrous oxalate, (2) the effect of sodium carbonate or potassium carbonate on the coloration of ferric or ferrous oxide and (3) the effect of potassium-sodium tartrate or arsenious acid on the color, imparted by ferric or ferrous oxide. S. KONDO

124. Study of chemical glass ware. T. OGAWA. *J. Jap. Cer. Assoc.*, **355,** 91–7; **358,** 252–65(1922).—The results of chem. analyses and tests on the resistance to chem., impact and the sudden change in temp. of foreign and domestic chem. glass wares as well as those made by the author are given. In general, home products are inferior to foreign ones, owing to their improper compns. Furnaces producing high temps. and pots standing them are indispensable for mfg. chem. glasses of the best quality, since the constituents of glass which increase its resistance to chem. make it more refractory. Batches contg. proper propns. of zinc oxide, alumina, magnesia, boric acid and silica suit fur. with half-gas firing. The use of sands contg. alumina, feldspar, or dolomite is economical. S. KONDO

125. On the surface devitrification of sheet glass. Y. AMENOMIYA, K. KOJIMA AND H. OTA. *J. Jap. Cer. Assoc.*, **356,** 137–51(1922).—The paper relates to the surface devitrification of finished sheet glasses by ht. treatments. An elec. fur. was used. The microphotographs of several sheet glasses of two factories which have been heated to various temps. indicate that the temp. at which crystals begin to appear is about 700°C. The crystals produced at this temp. are spherulitic while they are changed to radiating needles, by heating at 750°. At 900°, the crystn. proceeds into interior of glass and it becomes a white sheet. At certain higher temps., the crystals melt and disappear; these temps. were 985–1130°C for 8 kinds of sheet glass. The reln. between devitrification and time of heating at various temps. is described. The time required for the devitrification which occurs in cooling a molten glass is far longer than that required for the devitrification in heating up. S. KONDO

126. Atmospheric pressure and refractive indices, with a corresponding table of indices of optical glass. J. W. GIFFORD. *Proc. Roy. Soc.* (London), **100A,** 621–6 (1922).—In work where an accuracy better than about a unit in the sixth significant figure is required it is necessary to allow for the effect of the variation of refractive index of air with variation in the barometric pressure. A table is given of the refractive indices to 7 figures for 13 different wave lengths from 7682 K to 4046 Hg for 3 crown and 4 flint glasses. E. D. WILLIAMSON (*C. A.*)

PATENTS

127. Method and means for forming and transferring gobs of molten glass. JOHN F. RULE. U. S. 1,413,788, April 25, 1922. The combination with a receptacle for molten glass having an outlet opening, of a mold below the opening open at its upper end and formed with an elongated tapered mold cavity smaller at the lower end than the

upper end, gob-transferring app. between the flow opening and mold comprising a carrier, transfer cups at the opposite sides of the carrier, the cups having gob-forming cavities shaped to conform substantially to the form of the mold cavity, means to intermittently rotate the carrier and swing the transfer cups alternately from receiving position to discharging position, and means to sever the glass and support the oncoming stream during the rotation of the cup carrier. C. M. S., Jr.

128. Glass-flow-off controller. Frank O'Neill. U. S. 1,413,183, April 18, 1922. The combination with a container for a pool of molten glass, the container having an outlet for the glass below the surface of the pool, of controlling means for the outlet comprising a support, a refractory plunger projecting downward into the pool and having an intermediate ht.-weakened portion, the plunger embodying an upper portion sustained by the support independently of the portions therebelow, the upper portion having a central passage therethrough to a lower portion, a threaded seat, a reinforcing stem for the refractory having threaded engagement with the seat, a ht. expansion take-up spring about the stem, the spring being sustained by the support for yieldably maintaining the plunger refractory portions assembled therewith, the upper held refractory portion relieving the ht. weakened intermediate portion from crushing strain, and the stem carried lower portion relieving the heat weakened intermediate portion from tension strain, thereby distributing the load of the plunger, and means for shifting the support to vary the submergence of the plunger in the pool and normally maintaining the support in plunger sustaining position. C. M. S., Jr.

129. Apparatus for the manufacture of glass in continuous sheets. Eugene Rowart. Belgium 1,413,238, April 18, 1922. In an app. for the manuf. of glass in continuous sheets, in combination, a melting fur. for the production of molten glass, a chamber communicating with the melting fur., burners at the ends of the chamber, whereby a high temp. is produced all around the chamber, a working chamber arranged between the burners and within the chamber, and a taking app. dipped in the molten glass contained in the chambers, the taking app. being located with its upper part in the working chamber and communicating directly at its lower end with the chamber containing the molten glass, the working and the upper part of the taking app. being vertically movable and separable from the lower part of the taking app., whereby the hot gas from the burners may act on the whole surface of the molten glass contained in the chamber and also within the taking app. C. M. S., Jr.

130. Method and apparatus for making glass. Hubert A. Myers. U. S. 1,413-766, April 25, 1922. Apparatus for making glass, comprising means to provide a reservoir supply of molten glass, means to form an opening or space for shaping the glass, through which the discharge of glass flows in molten condition from the reservoir, and instrumentalities to maintain the sides of the opening or space at a sufficiently high temp. to retain the necessary fluidity of the glass, and so that the sides of the opening will remain glazed with the highly liquid molten glass which adheres thereto from the passing flow, together with means to keep the glazed sides moving with the flow of glass. C. M. S., Jr.

131. Stirring molten glass in continuous tank furnaces. Wilber F. Brown. U. S. 1,414,008, April 25, 1922. The combination with a continuous tank fur., whereby the molten glass flows continuously from the melting end to the delivery end of the tank, of an internally cooled rod extending transversely into the tank above the flowing glass, a porcelain stirring finger projecting downwardly from the rod into the flowing glass, and means for automatically and continuously reciprocating the rod, whereby the finger will break up the continuous flow lines in the glass and increase its homogeneity. (Cf. *Ceram. Abs.*, **1**, 79(1922).) C. M. S., Jr.

132. Means for filling glass melting tanks. Seth B. Henshaw. U. S. 1,409,716,

March 14, 1922. In an app. for filling glass melting tanks, a hopper adapted to be mounted adjacent the filling opening of the tank, means for moving the hopper to discharging position within the opening, a closure for the opening, and interconnecting means between the closure and hopper, so that one of them is moved into the opening when the other is moved away. C. M. S., Jr.

133. Ring mold for glass presses and the like. Peter Kucera. U. S. 1,412,358, April 11, 1922. As an article of manuf. a ring mold for pressed glassware and the like, the ring mold comprising a body portion of relatively soft metal and having the base of the matrix groove and an inner edge of hardened compacted metal integral with the soft body portion. C. M. S., Jr.

134. Processes and apparatus for feeding glass. William J. Miller. U. S. 1,413,757, April 25, 1922. In a glass feeder, for use in connection with a container for molten glass provided with a discharge port, the combination of reciprocating mechanical means for discharging glass at intervals through the discharge port, and for attenuating the neck of the protruding glass to facilitate severance, means for severing the neck to form gathers, and a pushback to be inserted into the outer end of the port for forcing the severed neck back into the port to temporarily interrupt the flow of glass. C. M. S., Jr.

135. Conveyor for heated glassware. Alexander Samuelson. U. S. 1,414,212, April 25, 1922. A conveyor for supporting and transporting heated glassware without cracking the same, which has a roughened surface to provide air cushioning and air insulation between the surface and the glassware to retain the heat in the latter. C. M. S., Jr.

136. Method of treating and working glass. Enoch T. Ferngren. U. S. 1,415,824, May 9, 1922. The method of forming mold charges which consists in flowing a stream of glass freely through a surrounding heat delivering flame and a heated shearing medium towards a series of molds successively elevating towards the stream and shearing medium, and successively severing mold charges at the shearing medium without obstructing the downward movement of the remaining portion of the stream. C. M. S., Jr.

137. Apparatus for drawing glass. Allen P. Wittemore. U. S. 1,415,133, May 9, 1922. An app. for drawing glass cylinders, a cooling ring arranged to surround the cylinder adjacent to the drawing point, and a sectional shield detachably secured adjacent to the inner face of the ring for locally retarding its cooling effect upon the article being drawn. C. M. S., Jr.

138. Glass-cutting square. Henry E. Johnson. U. S. 1,415,650, May 9, 1922. A glass support and cutting guide comprising a pair of right-angularly connected arms, oblique braces between the arms, the arms and braces being adapted to support a sheet glass to be cut, one of the arms having a vertical longitudinal stop rib for one edge of the glass, both of the arms having graduations, the inner end of the rib terminating adjacent the inner edge face of the other arm, a cutter guiding-arm pivotally connected to the outer end of the other arm, and a detent by the inner end of the rib for gripping engagement with the free end of the pivoted arm, to releasably hold the arm against the end of the rib and the glass on the angularly connected arms and braces. C. M. S., Jr.

139. Glass composition. Harry T. Bellamy and Burton T. Sweely. U. S. 1,415,980, May 16, 1922. A binder for higher resistance compns., comprising a non-electrolytic glass composed of silicates and borates of calcium and barium. C. M. S., Jr.

140. Glass-handling apparatus. Earl G. Chase. U. S. 1,414,547, May 2, 1922. A glass horse comprising a supporting base, series of uprights mounted at opposite sides

of the base, saddles comprising flexible members suspended between corresponding upright of the two series, the saddles being normally slack, and means whereby the slack of the saddles may be independently adjusted. C. M. S., Jr.

141. Apparatus for feeding glass to molds. Enoch T. Ferngren. U. S. 1,414,561, May 2, 1922. In an app. for sepg. molten glass into mold charges, the combination of a container for the glass provided with a submerged discharge outlet, a hollow member having its lower end submerged in the glass opposite the outlet and spaced therefrom, and rigid means for creating a flow of the glass in the member toward and from the outlet. C. M. S., Jr.

142. Mechanism for transferring glassware. Richard La France. U. S. 1,413,741, April 25, 1922. The combination with an endless conveyor adapted to receive and convey articles seriatim, of a stop in the path of the articles to arrest them while on the conveyor, means to shift the articles laterally off the conveyor, a gripper, and means to operate the gripper to engage the articles, move the gripper bodily forward and then release it from the article. C. M. S., Jr.

143. Milky semitransparent glass. Kitsuzô Fuwa and the Tokyo Denki Kabushiki Kaisha (the Tokyo Electric Co.). Jap. 39,448, Aug. 3, 1921. Glass is made by adding 1.5–3.0% cryolite, 0.5–3.0% $BaSO_4$ and below 1% NaCl to a common glass. The best total compn. is sand 100.0, steatite 35.5, litharge, 7.5, ZnO 3.0, $NaNO_3$, 6.1, Na_2CO_3 34.6, boric acid 4.5, arsenic oxide 0.5, $BaSO_4$ 1.5, cryolite 3.8, NaCl 1.9 and antimony oxide 0.4. Microscopical bubbles produced in the material make it milky and semi-transparent. It is suitable for illuminating materials, such as shades for elec. lamps. (*C. A.*)

144. Opal glass. A. L. D. d'Adrian. U. S. 1,419,032, June 6. An ordinary glass compn. is combined with fluostannite of Mg, Ba or Pb or other metals or silicofluorides to produce opal glass. (*C. A.*)

Enamels

145. Effect of variation in the composition of ground-coat enamel on its adherence to iron. S. Mori. *J. Jap. Cer. Assoc.*, **343,** 233–6; **344,** 272–7(1921).—Adherence of ground-coat to iron was measured by impact test, using soft steel sheets, gauge No. 28 and 1″ x 2.5″ large, as test pieces. An enamel which had proved to be very good in practice was taken as the basis of expts. Its formula is 0.455 Na_2O, 0.245 K_2O, 0.232 CaO, 0.016 CoO, 0.955 MnO, 0.198 Al_2O_3, 1.490 SiO_2, 0.455 B_2O_3, 0.200 F_2. Now the content of silica, boric acid, alumina, soda, potash or lime was varied within ranges as follows: 1.266–1.754 SiO_2; 0.455–3.200 B_2O_3; 0.198–0.227 Al_2O_3; 0.426–0.561 Na_2O; 0.214–0.306 K_2O and 0.136–0.544 CaO. Conclusions are: (1) Any increase in silica or boric acid reduces the resistance to chipping; (2) the resistance of enamel to chipping increases with the addition of alumina; (3) adherence of ground-coat is strengthened by the increase of soda, potash or lime up to a certain degree beyond which the effect is reversed. S. Kondo

146. Study of vehicles used in enamelling slip. S. Mori. *J. Jap. Cer. Assoc.*, **352,** 630–40(1921).—Explanations and discussions on the reason why enamellers use vehicles or stiffening materials, the rôle of clay in enamelling slips, theories of deflocculation of the slip, and the action of vehicles on the slip are given. The effect of various vehicles on the viscosity of an enamelling slip is shown with diagrams. A ground coat enamel with formula as 0.455 Na_2O, 0.245 K_2O, 0.232 CaO, 0.016 CoO, 0.055 MnO, 0.198 Al_2O_3, 1.49 SiO_2, 0.49 B_2O_3, 0.20 F_2, ground with 5% of washed Gairome (plastic kaolin) and 35% of water, was used for the expts. The amts. of vehicles required for one litre of slip in making its viscosity most suitable for working were as follows:

sodium chloride 4.68 g., barium chloride 0.732 g., aluminium chloride 0.3 g., sodium carbonate 8.4 g., ammonium carbonate 0.9 g., borax 1.08 g. or brine 4 cc. The effect of vehicles diminishes with the lapse of time. Concluding from the results, the author recommends (1) the use of least water, (2) the removement of water on storing slips, (3) when the use of vehicle is needed, borax, ammonium carbonate or soda-ash for ground coat, barium chloride or soda-ash for cover coat, and aluminium chloride or calcined magnesia for sol. enamels as semi-fused ground coat of cast-iron ware, and (4) the use of stiffened slip within a few hours. S. KONDO

147. Study of the opacity agents for enamels. T. UCHIDA. *J. Jap. Cer. Assoc.*, **357,** 189–201(1922).—Although antimony which is generally used in Japan for making white enamels is inexpensive and effective, so far as opacity is concerned, it is by far inferior to stannic oxide as to the appearance of enamel and moreover enamels with antimony can not be exported to some countries where their use is forbidden, and consequently the study of its substitutes is needed. The results of numerous expts. in which various substances were ground with 10 times its weight of frit, made from 26 kg. borax, 59 kg. feldspar, 2 kg. nitre and 13 kg. cryolite, applied on sheet iron and fired after drying are as follows: (1) Among opacifiers on market and those substances which were considered of high promise, only two specimens of stannic oxide proved to be excellent, Terrar, zirconia, cerium carbonate, and a specimen of stannic oxide were good and antimony oxide, rutile and Izushi clay were pretty good; (2) of various metal oxides, obtained by calcining oxalates, those of tin, zirconium, antimony and cerium were good and the oxides of lead, zinc and arsenic were pretty good; (3) among several compounds of tin, stannic oxide obtained by calcining the hydroxide at 1050°C was excellent and stannic hydroxide was good; (4) antimonic anhydride and antimony tetroxide are better than the trioxide; (5) of various antimonates and stannates, only calcium antimonate proved an excellent opacifier, and zinc stannate was pretty good; (6) the process of mfg. a compd. affects its quality as opacifier, *e. g.*, the stannic oxides which have been manufd. by igniting meta-stannic acid, $SnO(OH)_2$, obtained by oxidizing metallic tin with nitric acid, at 670–1060°C have proved pretty good opacifiers while good ones have been obtained by heating it at 1100–1230° and at last excellent ones at 1280–1435°; (7) the oxides, silicates and phosphates of aluminium and magnesium deteriorate the lustre of enamels. S. KONDO

148. Marine blue pigment for enamelling. T. FUKUDO. *J. Jap. Cer. Assoc.*, **348,** 432–8(1921).—Marine blue color of enameled wares is usually produced in Japan by adding copper oxide to raw batches. Since various difficulties have been experienced by enamelers in such a method, its improvement is needful. A German pigment which is added at the mill in the manuf. of marine blue wares was analyzed with the result: 32.44% alumina, 4.64% silica, 1.28% magnesia and 0.60% moisture and loss on ignition; and a similar pigment made by heating a batch of 33 cobalt oxide, 24 chromic oxide, 35 alumina, 2 stannic oxide, 1 magnesia and 5 silica to cone 13 was almost as bright as the imported one. The shade of the pigment can be easily controlled. The effects of the introduction of various substances to the raw batch of pigment upon clarity of the color are described; in short, the addition of stannic oxide, antimony oxide or bone-ash makes the color clear, while zinc oxide, magnesia, lime and silica tend to make the color dark or gloomy. The most economical method is in the utilization of impure alumina which is obtained as residue in the process of extracting alum from calcined alunite; the alumina used in the expts. had 65.33% alumina, 28.50% silica, 2.46% sulphuric anhydride, 0.67% ferric oxide, 1.25% lime and 1.80% potash. A pigment, made by heating a mixt. of 55 impure alumina, 26.1 cobalt oxide and 18.9 chromic oxide to cone 13 or 15, was as excellent as that imported from Germany. In enameling, 2% of pigment is added at the mill. S. KONDO

PATENT

149. Enamel. WILLIAM A. BRIGGS. U. S. 1,409,919, March 21, 1922. A compn. enamel including 25 to 55 parts by wt. of copal gum, 5 to 35 parts by wt. of rosin, 10 to 40 parts by wt. of filling material, and 10 to 35 parts by wt. of oil. C. M. S., JR.

Cement, Lime and Plaster

150. Study of gypsum. K. KISHIMOTO. *J. Jap. Cer. Assoc.*, **357**, 201–16(1922).—The results of expts. in which 1 g. of a pure gypsum was heated in an elec. fur. at various temps. for different times, indicate that the mineral loses its water when it is heated at 90°C or higher, but the rate is very slow at 90°. Sol. anhydrite is strongly hygroscopic and changes readily to the hemihydrate in the atm. The hemihydrate takes moisture from the atmosphere; this phenomenon is merely due to physical adsorption. S. KONDO

151. Accelerated tests of Portland cement. S. KANO. *J. Ind. Chem.* (Tokio), **7**, 657–99(1921).—Hitherto proposed methods of the accelerated testing of Portland cement are described and discussed. Two Portland cements with following compns. were used throughout the study:

Cement	Insol. residue	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	SO_3	Loss on ignition	Total
A.....	0.20	24.42	3.80	3.25	63.52	1.03	0..97	2.10	99.29
B.....	0.17	24.67	4.61	3.20	63.79	0.72	1.02	1.75	99.93

Thin pats of both cements stood the four-week cold-water test, but in boiling test of an hour and a half, the pats of B were badly cracked while those of A remained sound. To see the effect of heating the briquettes during their hardening on the strength of cement mortars, test pieces which have been allowed to remain in moist air for 24 hrs. were immersed in water of ordinary temp., and then the whole vessel was put in a larger tank contg. boiling water which brought the temp. of the water in the inner vessel to 97–98°C in about $1^1/_2$ hrs. Some of the results are given in the following tables:

TABLE I

		Cement A			Cement B		
		Tensile strength		Crushing strength	Tensile strength		Crushing strength
		Neat cement	Cement 1 Sand 3	Cement 1 Sand 3	Neat cement	Cement 1 Sand 3	Cement 1 Sand 3
Per cent of water used		14.5	7.5	7.8	14.5	7.0	7.5
Temp.	Age of hardening						
97–98°	1 day	32.3	11.0	48.0	..	..	...
97–98°	2 days	75.8	15.9	182.0	75.0	16.4	162.1
97–98°	3 days	84.1	20.3	234.0	86.8	19.8	217.0
97–98°	4 days	66.6	21.0	258.5	93.6	21.0	258.0
97–98°	5 days	72.1	22.0	278.5	77.8	21.9	270.0
97–98°	6 days	73.4	21.4	285.5	78.1	21.1	301.0
97–98°	7 days	77.1	23.1	302.5	76.1	22.5	303.0
8–18°	7 days	66.4	22.5	131..5	61.8	21.0	117.0
8–18°	28 days	68.9	30.3	196.5	65.9	29.0	181.0

Thus, the tensile strength of neat cement mortar, when it is hardened at high temperatures, gets to a maximum within three or four days and then falls rapidly. Similar phenomenon is also observable in cement-sand mortar, though it is by far feebler. Since such an irregularity does not occur in the crushing strength, its test is more reliable

than that of tensile strength. The expansion of these cements hardened at ordinary and high temperatures have been measured:

TABLE II

EXPANSION OF NEAT-CEMENT MORTAR, MEASURED WITH BAUSCHINGER'S APPARATUS, AT 15°C

	Cement A		Cement B	
	Hardened at ord. temp.	Hardened at high temp.	Hardened at ord. temp.	Hardened at high temp.
Time of hardening	0.0303%	0.0808%	0.0287%	0.1442%
3 days	0.0386	0.0832	0.0481	0.1570
7 days	0.0424	0.0674	0.0538	0.1468
14 days	0.0547	0.0694	0.0650	0.1468
21 days	0.0547	0.0694	0.0650	0.1468
28 days	0.0590	0.0688	0.0758	0.1504

The reason why cement B has failed in boiling test for soundness is clearly explained in the table. Besides these, the moisture and loss on ignition of test pieces, made in similar manner, have been determined. S. KONDO

152. Non-slip surfaces. ANON. *London Times Supp.* (Eng. Sec.), **10,** 173(1922).—Non-slip stair-treads, foot-paths, and railway platforms of silicon-carbide and fused bauxite of the Paris Metropolitan Railway have been surfaced with cement with silicon-carbide incorporated present a non-slip surface, show scarcely any signs of wear. The abrasive surface consists of not less than 1 lb. of granulated abrasive incorporated into each sq. ft. of the granolithic surface to the depth of 1/4 in. The granolithic mortar placed to 1/4 in. of the finished surface and into it troweled first a dryer consisting of 1 part abrasive material, 1 part sand, and 2 parts cement; followed by a second dryer consisting of 1 part abrasive material and 2 parts cement, troweled in until at least 1 lb. per sq. ft. of abrasive material is incorporated and the surface brought to proper level. O. P. R. O.

153. Manufacture of Portland cement. T. F. MILLER. *Chem. Trade Jour. and Chem. Eng.*, **130,** 71(1922).—Describes rotary grate shaft kiln. The perfect utilization of the ht. effects a saving of over 50% of the fuel used in the rotary kilns. They can be shut down for several days and started up again without difficulty enabling the closing of the works over week ends and holidays and in slack times. The power required is small in comparison with the rotary type, the grate itself taking from 2 to 3 h. p. The total does not exceed 18 to 20 h. p. including the briquetting press, the feeding device and fan. Descrip. and illus. given. O. P. R. O.

154. Light-weight concrete. ANON. *London Times Trade Supp.* (Eng. Sec.), **10,** 173(1922).—A memoir to the Académie des Sciences, Colonel Rabut, Inspecteur-General des Ponts et Chaussées, refers to exptl. researches on concrete made with slag of considerably lower sp. gr. than that of the gravel and broken stone. Slag concrete is generally stronger, though sometimes a little weaker, than gravel concrete, wt. 30 to 40% less than gravel concrete; ratio of strength to wt. attains max. with sand is from 1/4 to 1/5 that of slag used. Col. Rabut has constructed in slag concrete, the bridge carrying the station Asnieres and the Lestonnat Jetty in the port of Bordeaux. He has recently completed, in the arsenal of Lorient, a large jetty entirely in slag concrete, including piles 65 ft. 6 in. long by 15 3/4 in. square; he has constructed tank wagons and barges of the same material. O. P. R. O.

155. Artificial stones. ANON. *Gewerbefleiss,* **100,** 326–30(1921); *Chimie et industrie,* **7,** 944(1922).—The applications of magnesian (Sorel) cements are continually increasing on account of the great hardness and beautiful white color of the products made from them. Unfortunately, owing to premature setting in contact with moist

air, they can not be stored for any length of time or shipped. This drawback can be overcome by mixing $BaCl_2$ with the $MgCl_2$, and adding enough $MgSO_4$; so that in the presence of moisture the $BaCl_2$ and $MgSO_4$ yield Mg oxychloride and finally pure MgO. The resulting cement is still of a fine white color and can set with suitable amt. of aggregate. The author describes various processes for obtaining fine imitation marbles by using metal chlorides mixed with $MgCl_2$ instead of colored metal oxides. Similarly, natural stones can be given a mottled appearance by injections in the capillary fissures of the rock. A. P.-C. (*C. A.*)

156. Improved continuous-operation pot lime kiln. C. L. NORTH. *Rock Products*, **25**, No. 3, 47–8(1922).—Mostly mechanical. The main point of interest is in the use of a cone-shaped interior of the kiln rather than the usual kiln constructed with Dutch ovens on two or more sides. A diagram and the advantages of this cone-shaped kiln are given in detail. E. F. PERKINS (*C. A.*)

157. Process of improving the quality of mason's hydrated lime. FRANCIS C. WELCH. U. S. 1,410,087, March 21, 1922. The process of increasing the plasticity of mason's hydrated lime, which comprises the grinding of the mason's hydrated lime in contact with a drying agent. C. M. S., JR.

158. Method of calcining gypsum rock and the like. CHARLES R. BIRDSEY. U. S. 1,412,203, April 11, 1922. The method of mfg. gypsum products of different hygroscopic natures by a continuous operation which consists in calcining the crushed raw material, then sepg. the fine material from the coarse, the fine material providing a product of one hygroscopic nature, and finally grinding the coarse material to provide a product of a different hygroscopic nature. C. M. S., JR.

159. Plastic building construction. CHARLES B. SEIDLE. U. S. 1,409,246, March 14, 1922. In a building construction, a vertical double wall, including outer and inner sections affording an air space therebetween, the inner section being formed of horizontal layers of assembled blocks, horizontal plastic beams resting upon the top of the blocks in a selected horizontal layer and terminating substantially flush with the wall of the air space to leave such space substantially unobstructed, filler blocks arranged upon the top of the blocks in the same horizontal layer and disposed upon opposite side of the beams, floor slabs resting upon the filler blocks and terminating substantially flush with the wall of the air space to leave the same substantially unobstructed, and means for locking the floor slabs with the plastic beams, the blocks above the beams and floor slabs resting upon the floor slabs and beams. C. M. S., JR.

160. Wall covering or putty containing magnesium oxychloride. K. WOLF. U. S. 1,418,896, June 6. "Condensed" magnesite is heated to a low glowing temp., slaked after cooling, calcined and mixed with $MgCl_2$ soln. (*C. A.*)

161. Mortar and building-block composition. J. J. LEMON. U. S. 1,418,810, June 6. Ground yellow or white blast-furnace slag 7, sand 1, cement 1, lime 0.07 part and sufficient H_2O to form a moldable plastic compn. (*C. A.*)

162. Plaster mixture. W. T. FELS. U. S. 1,419,665, June 13. A mixt. of ashes 60, plaster of Paris 30, lime 9 and glue 1% is used for finishing walls. (*C. A.*)

163. Composition for building-blocks. F. PATEE. U. S. 1,418,160, May 30. Asbestos aggregate 5–7, portland cement 1, $Ca(OH)_2$ 0.1–0.2 parts are mixed with H_2O and molded. (*C. A.*)

164. Waterproofing cement compositions. G. H. HAVENS. U. S. 1,418,374, June 6. A mixt. contg. hydraulic cement, hydrated lime, slippery-elm bark, alum and $CuSO_4$ is used for building purposes. (*C. A.*)

Official Personnel of Divisions 1922–23

	Art	Enamel	Glass	H. Clay Prod.	Refractories	Terra Cotta	White Wares
Chairman	F. H. Rhead	B. T. Sweely	J. C. Hostetter	C. F. Tefft	J. Spotts McDowell	A. F. Hottinger	F. K. Pence
Vice-Chairman	H. S. Kirk		A. R. Payne	D. F. Stevens	E. H. Van Schoick		
Secretary	M. C. Farren	R. R. Danielson	A. E. Williams	M. B. Greenough	Fred A. Harvey	R. L. Clare	C. C. Treischel
Committee on Research	F. H. Rhead	R. R. Danielson	E. C. Sullivan E. W. Washburn R. B. Sosman *	O. W. Renkert R. T. Stull G. W. Shoemaker Warren Griffis Paul E. Cox R. K. Hursh	R. M. Howe E. N. McGee G. F. Bissell W. E. Dornbach F. A. Harvey S. M. Kier	E. C. Hill Major Gates	F. K. Pence L. H. Bown F. S. Hunt V. S. Schory Ira E. Sproat O. O. Bowman, 2nd August Staudt Leslie Brown C. C. Treischel
Committee on Standards (*a*) Tests (*b*) Products	W. J. Stephani C. F. Binns	E. P. Poste D. F. Riess	(*a*) A. E. Williams W. F. Brown J. H. Forsyth (*b*) A. W. Bitting H. K. Kimble C. W. Parmelee R. J. Montgomery	P. H. Bates W. G. Worcester S. M. Duty R. A. Horning S. Geijsbeek	R. M. Howe E. N. McGee	(*a*) C. W. Hill D. F. Albery (*b*) J. L. Caruthers	H. S. Spurrier F. S. Hunt
Committee on Data	Conrad Dressler	R. R. Danielson	G. W. Morey W. C. Taylor G. E. Barton	H. G. Schurecht	C. W. Parmelee	T. A. Klinefelter	C. C. Treischel
Committee on Membership	W. W. Wilkins	W. C. Lindemann	E. W. Tillotson Jas. Gillinder W. S. Williams	D. F. Stevens H. S. Vincent J. E. Randall H. S. Langworthy J. J. F. Brand	W. E. Dornbach I. A. Krusen A. B. Christopher M. F. Beecher Mark Sheppard M. G. Babcock	W. D. Gates G. M. Tucker A. L. Gladding	Ira E. Sproat
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CERAMIC ABSTRACTS

Compiled by the

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General and Miscellaneous

1. Continuous kilns for pottery manufacture. ANON. *Brick Pot. Trade Jour.*, **30,** 205(1922).—The employment of continuous kilns for firing pottery has in some cases failed because the potters insist on burning colors in them—which is only practical in single ovens. Continuous kilns of the Hoffmann type have not been used to any great extent for domestic pottery, but have proved satisfactory for sanitary ware. There is no reason why they should not be used for whiteware. Tunnel ovens or car-kilns are suitable for whiteware but can only be used for a limited number of colors. The initial cost would be prohibitive for works with a small output but remunerative for a sufficiently large plant. The tunnel kiln can be filled more efficiently, which saving together with a reduction of cost of saggers and fuel favors this type of kiln. The tunnel oven has a small variation in output and in this respect is inferior to the continuous compartment kiln which can if the need arises be worked as a series of separate compartments. H. G. SCHURECHT

2. The business situation and outlook. ANON. *N. J. Ceramist,* **1** [2], 97–108 (1921).—A symposium of views of various business men regarding the business outlook, with particular reference to the clay products industry. C. W. PARMELEE

3. Symposium on gas firing. II. E. W. SMITH. *Trans. Ceram. Soc.* (Eng.), **21,** 189–207(1922).—In the Dayton system of vaporizing oil used in the U. S., four gallons of fuel oil give 1000 cu. ft. of gas having a calorific value of 450 B. t. u. M. W. TRAVERS. —In an investigation of direct fired coal furnace by the U. S. Bureau of Mines, it was shown that in every case the whole of the oxygen had disappeared before it had risen four inches from the fire bars, and that in every case the gas which came from the top was what might be called a fair producer gas. Every so-called direct-fired commercial furnace is actually a gas producer, in which the gas is sometimes burned by secondary

air, but very often is not burned. We should discard the word "direct-fired" and regard all coal fires as producer systems, in which the fuel is more or less efficiently gasified, and in which, above the fuel bed, the gases are more or less efficiently burned. Producer gas can be burned with cold secondary air. Preheating the air usually furnishes the only method of getting it into the furnace. When the furnaces are not furnished with recuperators, the air can be injected by means of a fan. The total efficiency of the recuperative furnaces is much higher than that of the non-recuperative furnaces, but the difference has nothing to do with the difficulty of burning the gas with cold air, for no difficulty has been experienced. The fact that furnace builders regarded the problem of introducing secondary air into furnaces as one involving statics rather than dynamics has been the cause of failure of many furnaces. One has not merely to consider whether air would flow through the channels in a certain direction, but whether the rate of flow will be sufficient to provide for the complete combustion of the gas. Lt.-Col. C. W. Thomas.—Whatever economies there are in gas firing will be found to result not from a mere change over in system from using solid fuel in a fire hole to gas from a producer, but the problem will resolve itself into a question as to whether or not recuperation is used in heating. In a continuous kiln, whatever may be the type of firing, recuperation always is employed. Attention should be given to the insulation of kilns. H. F. S.

4. Combustion of fuel oil; with a description of an oil-gas furnace. Percival J. Woolf. *Trans. Ceram. Soc.* (Eng.), **21,** 161–88(1922).—Experiments carried out with some fuel-oils indicate that below 200°C, the quantity that is vaporized is negligible, and that between 200°C and 300°C, only a small portion of the fuel-oil can be vaporized. When raised to a temp. of over 300°C the fuel-oil commences to vaporize more extensively, and when 400°C is reached it is substantially vaporized. At 450°C it has been found that it is completely vaporized except for a minute quantity of solid, this quantity being under 1%. To eliminate the excess air in burning oil, and at the same time obtain perfect combustion within the furnace proper, without increasing the size of the furnace or adding to it in the way of combustion chambers, the vaporization and mixing of the oil and air, prior to the entrance into the furnace, has been accomplished according to Woolf by the Sklovsky U. S. Patent No. 1,229,338. In this case the air is supplied under pressure, is forced through heating chambers which utilize the heat from the incoming gases, and is further forced from the heating chambers through a vaporizing chamber. Through the inlet the necessary fuel oil is supplied into the latter chamber, the oil being introduced into a stream of heated air; it passes through the vaporizer, together with the air, from which it absorbs the heat. By the time the exit of the vaporizer is reached the oil is completely vaporized and intimately mixed with the air, from which point it is conducted through a tube directly into the combustion chamber of the furnace. In this patent the air is maintained at not less than 300° and not over 400°C. Preferably the air should be 350 to 400°C. A description is given of the car tunnel kiln built at the plant of the Lennox Pottery Co., in Trenton, N. J., and arranged for firing with vaporized oil. It is a twin chamber furnace in which the stock progresses through the two chambers in opposite directions. The treating zone is near the center; thus a single source of heat supplies both chambers, and the entering cold stock is preheated by the treated stock enroute to the exit. The efficiency of this heat transfer is dependent upon the natural convection currents set up in the inert atmosphere of the furnace by the heat radiated by the charge. H. F. S.

5. The Marlow gas-fired tunnel oven. J. H. Marlow. *Trans. Ceram. Soc.* (Eng.), **21,** 153–60(1922).—A detailed description with drawings of a car tunnel oven fired with producer gas. The air for combustion passes in flues from the receiving end of the kiln through the firing zone and then to the burners. H. F. S.

6. The new ceramic station at Rutgers College, State University of New Jersey. ANON. *N. J. Ceramist,* **1** [2], 109–12(1921).—A brief statement regarding the plans for the erection of a building. C. W. PARMELEE

7. Tariff revision and regulation. WILLIAM BURGESS. *N. J. Ceramist,* **1,** 80–7, June(1921).—A discussion of the revision of the tariff with special reference to clay products. C. W. PARMELEE

8. Oil burning in a ceramic plant. R. L. CLARE. *N. J. Ceramist,* **1** [2], 126–30 (1921).—The author discusses oil burning under the following headings: The adaptation of fire box; the equipment required; comparison of relative costs of oil and coal. He finds that 150 gals. of oil will do the same work as a ton of coal in kiln practice, and better than that. At 5c. a gal. the relative cost of oil is $7.50, coal cost $6.00. He is of the opinion that this cost can be reduced by careful firing. The higher cost of oil is offset in a large degree by the fact that with oil there is a reduction in the amount of kiln labor necessary, also neither coal nor ashes have to be handled. C. W. P.

9. The Hardinge conical mill in the ceramic industry. HARLOWE HARDINGE. *N. J. Ceramist,* **1** [2], 137–44(1921).—There are two types, the conical ball mill and the conical pebble mill. The ball mill is used either for wet or dry grinding, and usually where the feed is comparatively coarse, that is, up to 2″, and where a slight iron contamination of approx. .05% will not be detrimental to the product. The pebble mill is used principally where this contamination is objectionable. By the use of the conical shape there is a segregating effect which occurs within the mill which permits of the use of a coarse feed, and the delivery of a fine product in one unit, and at the same time maintaining a high capacity for the power consumption. This shape also enables the mill to withstand shock and prevents undue wear of the lining. Also, the mill is extremely rigid in construction. *Feldspar grinding.*—A typical installation is a conical pebble mill 5 ft. in diameter. When operated in conjunction with a vibrating screen, for obtaining a fine product, the mill is capable of delivering a finished product in one operation. The product is approx. 90% through 100-mesh. An 8′ 30″ conical pebble mill requires 40 to 50 h. p. to operate, and has a capacity on ordinary feldspar grinding to 90% through 100-mesh, of $2^1/_2$ T. per hour, the repair costs averaging below 4 c. per ton over a period of 8 yrs. For the finer grinding of feldspar, that is, for a fineness of less than 1% on 140-mesh or 98% through 200-mesh, it has been found best to use two mills. The use of an air separator in conjunction with this mill not only gives a product of the proper fineness, but actually aids the operation of the mill. *Silica grinding.*—A 6′ by 48″ Hardinge pebble mill, requires approx. 30 h. p. operating in conjunction with an air separator, has a capacity of 1 T. per hr. the feed being 3/4″ and the product 90% passing a 200-mesh screen. The mill grinds with a minimum of fineness and when sharp corners must be retained on the particles discharged. C. W. P.

10. Description of a tunnel kiln in Czecho-Slovakia. H. BARKBY. *Trans. Ceram. Soc.* (Eng.), **21,** 277–88(1922).—This is a Faugeron kiln firing porcelain to cone 14. The compn. of the body is: China clay, 40; flint, 30; feldspar, 30. The glaze is composed of the body mixt. plus lime, part of the china clay being first calcined. The clay ware is fired first to about 950 °C in a tunnel kiln similar to the one described, after which it is dipped and both body and glaze matured at cone 14. The total length of the oven is 60 m. (196 ft.), with a fireplace on either side at the middle. The width of the inside is about 1.25 m. (4 ft.), and the length from the rails to the vault roughly 3 m. (10 ft.). Below the level of the rails is an inspection passage large enough for a man to walk down. It is almost the full length of the tunnel, with entrances at several convenient points to enable the attendants to pass from one side to the other without having to walk around the tunnel. At the entrance to the tunnel is situated the motor which drives the fan for drawing gases to the chimney and also which pushes the trucks

through. On the exit side of the fireplaces are 2 secondary air channels which conduct the heated air from the cooling goods to the fireplaces. The trucks measure 2 m. (6.5 ft.) long by 1.25 m. (4 ft.) wide. Immediately above the wheels is a platform made by strong sheets of iron with the sides turned down for a couple or 3 in. These iron lips are for the purpose of the sand seal. On this iron platform is built a solid bed of fire-clay bricks approx. 9 in. thick, to protect the iron and to insulate the oven. A groove runs along each side of this brickwork and into this fits a rib which runs the whole length of the tunnel. Above this solid bed of fire-clay bricks are arranged fire-clay studs similar in shape to a cotton bobbin, only much larger, being about 10 in. high. When these studs are placed side by side flues are formed both lengthways and crossways of the truck with gaps in the upper surface. The studs on either side are a little different in shape on the upper surface, so as to give a fairly straight edge to the truck. On this layer of studs are placed the saggars, containing the ware to be fired, to a height of 2 m. (6.5 ft.) and then above and across them are put fire-clay baffles. This completes the loading of the truck, but before it is sent into the tunnel it is passed under a loading gauge similar to those used on the railway to see if it is over or under loaded. Although air locks are provided at the entrance and exit, they were not being used. The saggars and fire-clay baffles fit so close to the walls and roof of the tunnel that they are not needed. The gases, on leaving the tunnel, are at a temperature not higher than 300 to 350°C and are used for heating a greenware house and storerooms before going into the chimney. The goods as they leave the tunnel are cool enough to handle. The saggars are thinner than those in common use here and are machine made. The underneath surface of the saggar is concave, which it is claimed, gives strength with lightness. The tunnel holds 30 trucks, and a truck travels from one end to the other in 36 hrs. In 24 hrs. the output is almost equal to one 18-ft. round oven. The coal consumption per day is about $2^1/_2$ to 3 T. of local brown coal. As they are firing porcelain, it is necessary to have a reducing atmosphere, and they "smoke" for $^2/_3$ of the distance from the fireplaces to the entrance. Repairs are very small. Only once a year is it necessary to attend to the fire boxes. The under carriages which were put into use 12 to 16 yrs. ago are still running without having been repaired. The following kilns are in use on the Continent: For earthenware industry 9 kilns; for porcelain 7 kilns, with 3 being built; for fire-bricks 2 kilns; for wall tiles 1 kiln, with 1 being built. In the discussion, doubt was expressed by several potters as to whether the drop arches and clay baffles produced an up-and-down flame of gases in the Faugeron kiln. H. F. S.

11. Surface combustion and the possibility of its adaptation to the ceramic industry. W. STEGER. *Trans. Ger. Ceram. Soc.*, **2**, 83(1921).—Surface combustion will probably find application first for heating muffle or tunnel kilns. The burning of limestone, dolomite, magnesite, etc. can be carried on economically by this method as high temperatures can be reached with a comparatively poor gas seeing that combustion takes place in the restricted space between the fragments of the charge. The suggestion is made that this firing method would find successful application in the burning of the Dressler tunnel kiln if the hollow interior lining of the fire zone were filled with suitable refractory fragments and the gas was drawn through this mass under a slight vacuum. The research laboratory of the State Porcelain Works, Berlin, has installed several miniature kilns of this type for further study. F. WHITAKER

12. Soap making possibilities in china-clay. ANON. *The London Times Trade Supplement*, **101**, 457(Aug. 19, 1922).—Expts. have been proceeding for some time which have for their object the developing from china-clay, a colloidal clay as an integral part of soap. As it supersedes the fats and oils usually employed in the making of soap, it is claimed that it will produce a cheaper soap and create a new demand for china-clay. The expts. also show that it is possible to make a colloidal clay soap directly from either

(1) an oil or fat or (2) a mixt. of fatty acids, the soap produced having similar properties to that made by incorporating the colloidal clay after the soap has been made. The greatest value of the direct method of prepg. a colloidal clay soap lies in the saving of time required for saponification. Other advantages over ordinary soap that colloidal clay soap is said to possess are: (1) It is more sol. in water and produces a lather quicker. (2) It is ready for use sooner after manuf. than ordinary soap and dries quickly; does not become too dry by long keeping. (3) It is less likely to contain free fatty acids or free alkali; the quantities of reacting material can be more easily adjusted, and any slight excess of alkali is counteracted by the absorbent power of the colloidal clay. (4) It improves greatly in quality on aging, whereas soap alone generally deteriorates after 18 mo. or so. Mr. F. E. Weston, one of several industrial chemists who have been carrying out expts. states that it cannot be maintained that colloidal clay is only playing the part of a "filler;" it is more in harmony with exptl. fact to term it "an active principal." The china-clay producers are alive to the possibilities of this new outlet for china-clay, and some of them are either producing colloidal clay or are prepg. to do so. O. P. R. O.

13. Fuel economy and production expenses. Allen M. Perry. *Elec. World,* **80,** 115–8(1922).—Data are given for elec. plants burning coal, oil, gas and hogged fuel. Careful analysis of data permits interesting comparisons between the results obtained. Today some of the plants are getting back to a net station cost of about $0.01 per kw.-hr. C. G. F. (*C. A.*)

14. The practical economization of coal fuel and the responsibility for it. W. E. Appleby. *Commonwealth Eng.,* **9,** 396–404(1922).—A discussion of the principles of fuel saving in boiler plants, presenting charts and formulas for computing losses from CO_2 recorder readings, and the saving effected by economizers. E. W. Thiele (*C. A.*)

15. Waste-heat boilers in steel plants. J. C. Hayes. *Blast Furnace and Steel Plant,* **10,** 355–6(1922).—The installation of waste-heat boilers in steel plants is becoming more and more important. In most modern plants the boilers are either being placed or space is left for their later installation. A boiler for this purpose is differently arranged from the firing type, because ordinarily the larger part of the heat transmitted into the boiler water is from radiation; this is usually absent in waste gases. The boiler must, therefore, be arranged so that the gases have greater contact with the boiler surfaces in order to prevent the stagnant film of gas from being present. An ordinary 75-ton open-hearth furnace is capable of yielding power equal to 350 boiler h. p. per hr. in steam of 160 lbs. pressure and 100° superheat. W. A. Mueller (*C. A.*)

16. Keeping down the furnace losses. R. T. Haslam. *Power,* **55,** 372–5(1922).—A certain amt. of excess air is necessary for most economical operation of a boiler. Charts are shown wherefrom the correct amt. of excess air may be calcd. after analyzing the flue gases with an Orsat app. and detg. the stack temp. D. B. Dill (*C. A.*)

17. Low ash coal not always desirable. S. W. Flagg. *Power,* **55,** 328–30(1922).—A high-grade coal with 4.30% ash gave considerable trouble when used in an automatic stoker. The tops of the grate bars reached a dark red to cherry-red temp. and serious damage to the bars resulted. Expt. proved that the lack of ash in the coal prevented the formation of a heat-insulating layer of ash over the bars. The substitution of a high-ash coal solved the problem. D. B. Dill (*C. A.*)

18. The economical production and use of steam. J. R. Hannan. *J. Textile Inst.,* **13,** 95–100(1922).—A comparison of the coal-fired and the oil-fired boiler. An argument is advanced in favor of a condensing unit in a plant which uses process steam. L. A. P. (*C. A.*)

19. Some suggestions concerning the college education of an engineer. Carl Hering. *J. Am. Inst. Elec. Eng.,* **41,** 415–7(1922). B. G. Lamme. *Ibid.,* 406–9.

S. E. Doane. *Ibid.*, 409–11. Philip Torchio. *Ibid.*, 412–3. Taliafero Milton. *Ibid.*, 606–9. L. A. Ferguson. *Ibid.*, 570–1. C. G. F. (*C. A.*)

20. Industrial electric heating. W. S. Scott. *Elec. J.*, **19**, 203–8(1922).—Modern elec. furnaces and ovens for annealing, hardening, tempering, drying, baking, enameling, glass and ceramics are briefly considered. In the appendix 21 examples of various heating processes are cited with detailed operating data. C. G. F. (*C. A.*)

PATENTS

21. Kiln with heating chambers and cooling chambers. Victor Gelpke. Luzern, Switzerland. 1,426,287, Aug. 15, 1922. A kiln, comprising, in combination, a furnace, a heating-chamber, a cooling chamber, and a compensating-member arranged between the chambers; the member consisting of two sheet-metal plates arranged at an appropriate distance one from the other, and gas-tight connections between the plates, as well as between them and the structure-components with which they are connected. C. M. S., Jr.

22. Plastic composition and articles formed therefrom. James P. A. McCoy. U. S. 1,425,784, Aug. 8, 1922. An insulating compn. comprising bakelite mixed with a polymerizable resin. C. M. S., Jr.

23. Burning ceramic wares and apparatus therefor. Taine G. McDougal. U. S. 1,416,726, May 23, 1922. That improvement in the art of burning ceramic wares which consists in continuously passing the wares through a kiln having a preheating zone, a high-temperature zone and a cooling zone, and maintaining the wares openly exposed to radiation from the under surface of the ceiling of the kiln in the high-temperature zone for a period sufficient to insure thorough burning throughout the whole mass of the wares, the under surface being intensely heated by combustion in the space between it and the wares. C. M. S., Jr.

24. Tunnel kiln. Ellsworth P. Ogden. U. S. 1,418,669, June 6, 1922. A tunnel kiln provided with a main stack or fan and also having an auxiliary stack or fan independent thereof by which special bases and vapors which have been introduced into the kiln for special purposes may be removed therefrom without resort being had to the means for inducing the main draft. C. M. S., Jr.

25. Burning ceramic wares. Taine G. McDougal. U. S. 1,416,727, May 23, 1922. In a continuous kiln for burning ceramic wares, a thin highly refractory carrier forming the support for the wares, supporting means on which the carrier travels through the kiln, the space about the supporting means being filled in with heat insulating material to a level close up to the lower side of the carrier, the supporting means including a highly refractory element projecting through the floor of the kiln on which the carrier directly rests and with reference to which the carrier is movable. C. M. S., Jr.

26. Gas-fired pottery kiln. Arthur McDougall. London. 1,423,408, July 18, 1922. A gas-fired rectangular kiln for burning argillaceous ware, a gas bag therein constructed independently of the brickwork of the kiln, the gas bag dividing the kiln into a plurality of compartments, the bag having constricted apertures in the sides and top whereby heating gases escaping from the bag are evenly distributed and traverse the ware contained in the kiln between the bag and the walls of the kiln, the bulk of the gas passing through the ware in a horizontal direction. C. M. S., Jr.

27. Weatherproofing clay. W. H. Allen. U. S. 1,421,888, July 4. The capillarity of the surface of an unbaked clay article is destroyed by pptg. Ca silicate in its interstices. (*C. A.*)

Apparatus and Instruments

28. Disappearing filament optical pyrometer free from diffraction effects at the filament. C. O. Fairchild. *Phys. Rev.*, **18**, 116–8(1921); *Science Abstracts*, **23A**, 224. H. G. (*C. A.*)

29. The use of commercial viscosimeters. H. GAULT AND L. BOISSELET. *Mat. grasses*, **14**, 6185(1922).—In a particular instance an Engler-type viscosimeter gave a viscosity at 50° for a machine oil 1° Engler lower than a standard instrument. This was traced to the fact that the capacity of the chamber in the first instrument was 8 cc. too great, causing an increase in head. This did not appreciably affect the rate of flow of water at the temp. of standardization, but increased that of the oil at 50°.

A. P.-C. (*C. A.*)

30. Note on pipettes. VERNEY STOTT. *J. Soc. Glass Tech.*, **20**, 307–25(1921).—A collection of data on the variation of the volume delivered by pipettes of capacity 2 to 100 cc. with the delivery and drainage time. Class A pipettes should be adjusted for a particular delivery time which should lie between certain limits, depending on the capacity, and a definite time should be allowed for drainage when graduating, testing, or using them. G. S. FULCHER

31. Pyrometer possibilities. WALTER A. HULL. *N. J. Ceramist*, **1** [2], 113–6 (1921).—Brief article outlining the function of pyrometers and their value as a permanent investment. C. W. PARMELEE

Chemistry, Physics and Geology

32. Asbestos in the Union of South Africa. A. L. HALL. *Union of S. A. Dept. of Mines and Industries, Memoir*, **12**(1918).—The Union of S. Africa contains large asbestos deposits and holds the world's record for varieties of fibre. In areal extent the crocidolite belt of the Cape Province is the largest asbestos area of any kind hitherto recorded. The fibre varieties comprise the following, named in order of abundance: (1) *crocidolite*, (2) *amosite*, (3) *chrysotile*, (4) *tremolite*. These varieties are distributed thus: (1) the Cape, crocidolite, (2) the Transvaal, crocidolite, amosite, tremolite, and chrysotile, (3) in Natal, chrysotile and tremolite. The Free State has not so far furnished any asbestos deposits. Crocidolite or "Cape blue" is the best-known variety in the Union; its occurrences having been exploited without interruption since 1892. The crocidolite belt in the Cape measures some 250 mi. in length, with a max. width of over 30 mi.; this distribution consists of a great thickness on thinly-bedded ferruginous siliceous slates or banded ironstone, to which the crocidolite is confined in the form of many strictly interbedded cross-fibre seams, ranging from the max. of 5″ downwards; most of the seams consist of lavender blue fibre from $^1/_4$″ to 1″ in length. In the Transvaal crocidolite interbedded cross-fibre seams occur in the basal portion of the Pretoria Series close to the underlying dolomite, in ferruginous siliceous slates practically indistinguishable from banded ironstones, and consist of the same lavender-blue fibre as in the Cape belt. Their exploitation is still in the initial stages. Amosite has so far been found in the Transvaal only. It forms a new variety of asbestos as a monoclinic ferrous silicate amphibole with or without soda. Amosite is an ash-gray or pale brownish mineral, occurring as interbedded cross-fibre seams in the same banded ironstones of the basal portion of the Pretoria Series (close to the underlying dolomite) in which crocidolite is found. The length ranges from the not uncommon value of 11″ downwards; very frequently from 4″ to 7″ wide over considerable distance. Chrysotile forms a commercial occurrence in the Transvaal only. This asbestos forms cross-fibre seams interbedded in altered dolomite and ranging from the very rare maximum of 7″ downwards. Seams of $^1/_2$″ in thickness are common. The Natal chrysotile is found in cross-fibre seams in dark greenish serpentine and disposed vertically along and very close to the contact with an aplite intrusion. These deposits appear closely analagous to the Canadian type of deposit. The present economic situation makes the establishment of local mfg. industry of asbestos goods very welcome. Such factories exist, in which crocidolite, amosite, or tremolite (with its country rock of talc) are

adapted to various uses; among these, the requirements of the building material and engineering trades claim first attention, *e. g.*, roofing tiles, flooring, coiler lagging, etc. The suitability of Cape blue for the manuf. of goods requiring spun fibre has long been well established, and recent expts. carried out under proper technical conditions have demonstrated that amosite can also be fiberized and adapted for yarn production. This memoir contains analyses of asbestos, a bibliography on the subject; also maps and plates. O. P. R. O.

33. Neutral salt. ANON. *Raw Materials Rev.* (London), **1,** 167(1922).—With the development of the production of synthetic ammonium sulphate, it is reported that sulphate fertilizer, which has always contained an excess of acid, is now giving way to the neutral ammonium sulphate. It is predicted that within the next 2 yrs. it will have become impossible to sell the acid-contg. product. There are many processes whereby acid-contg. ammonium sulphate may be converted into the neutral product, or whereby the natural product can be made directly. These processes may be classified as follows: (1) Washing or spraying processes: (*a*) With atomized water; (*b*) with treated mother liquor; (*c*) with weak solns. of ammonia obtained in various ways. (2) Treatment with gaseous ammonia under a moderate pressure. (3) Incorporating a neutralizing agent in solid form. (4) Production of neutral ammonium sulphate within the saturator or saturators. The production of the neutral salt entails careful chem. control, and the process requires supervision by trained men. At the present time the importance of this new development in the sulphate industry is, perhaps, of moment to the English fertilizer industry only. It is believed, however, that before long its significance will apply to other countries as well, for it is contended that the neutral ammonium sulphate is more effective as a fertilizer than the acid salt. O. P. R. O.

34. Rhodesia asbestos. ANON. *Raw Materials Rev.* (London), **1,** 143(1922).—The 1921 output of Rhodesia asbestos was valued at £795,699, as against £5,224 in 1913. It should be noted that Rhodesia is second only to Canada in the production of asbestos. O. P. R. O.

35. Fluorspar in Prussia. ANON. *Raw Materials Rev.* (London), **1,** 155(1922).—Fluorspar, or calcium fluoride, is the only material which is used in Prussia for the production of hydrofluoric acid. It is used also in certain metallurgical processes, such as in the smelting of roasted copper ore, and, as long as it remains cheap enough, in the iron works. Colorless fluorspar has also been used for optical purposes. Fluorspar is found only in gangue, and therefore is frequently with iron. The occurrence of fluorspar in Germany is very frequent, although mostly in small volume. It is produced at Uftrugen, and in the Claustaal. O. P. R. O.

36. The reversible thermal expansion of silica. H. S. HOULDSWORTH AND J. W. COBB. *Trans. Ceram. Soc.* (Eng.), **21,** 227–76(1922).—The reversible linear expansions of various forms of silica, raw and manufd. were detd., and along with them permanent changes in sp. gr. and refractive index. Pure amorphous pptd. silica underwent no change at 700°C even on prolonged heating, but after heating at 1170°C or cone 14, showed the great expansion between 200 and 300°C, characteristic of cristobalite (with a little tridymite). Pptd. silica contg. 5% soda showed the cristobalite expansion between 200 and 300°C after heating at 700°C, but heating at 1170°C, or at cone 14 gave the smaller (tridymite) expansion between 100 and 170°C and some cristobalite. The presence of the soda was apparently responsible for the formation of cristobalite at a lower temp., and for the formation of tridymite. Silica glass (vitreosil) gave very little thermal expansion but the refractive index corresponded with the formation of tridymite, to a small extent at cone 14 and to a considerable extent at cone 20. Quartz was not formed from amorphous silica in any of the above expts. Meanwood ganister with lime bond showed no cristobalite after a works burn to cone 9 but a little

cristobalite along with quartz after a lab. burn to cone 14, and more cristobalite at cone 19. Repeated works firing at cone 9, however, gave a little cristobalite even without bond. Welsh quartzite with lime bond transformed more easily. It gave a little cristobalite in the quartz at cone 9 (works burn), more at cone 14, and all cristobalite at cone 20. Flint with lime bond transformed more easily still. It gave some cristobalite at cone 9, nearly all at cone 14, and all at cone 20. None of these raw materials gave tridymite in any quantity. All of them underwent a considerable permanent linear expansion in the lower temp. ranges before any conversion of quartz occurred. The true sp. gr. and refractive index were not altered thereby but the porosity increased. The amount of the change differed in the three materials. (*a*) From Welsh quartzite, fired at cone 16. This brick showed the large cristobalite expansion between 200 and 300°C, and also some quartz expansion between 500 and 600°C. (*b*) From Yorkshire quartzitic pebbles. This brick showed the α to β cristobalite expansion, but no α to β quartz expansion between 500 and 600°C. A little tridymite may have been present. Silica bricks (from Welsh quartzite) after long use. (*a*) In coke oven (maximum temperature 1450°C). The innermost exposed layer was an impure glass with a steady expansion but only half as large between 15 and 1000°C as that of the layers behind, which will make for shelling away. The rest of the brick was all cristobalite with very little quartz or tridymite. Examn. of commercial silica bricks and used bricks from coke ovens and steel furnace roofs showed that the exposure to high temp. had evidently completed the change from quartz to cristobalite which had been largely effected in the kiln during manuf. Little or no tridymite was found. The vol. changes in manuf. and use of a silica brick may therefore be traced thus: First, on burning, the quartz undergoes a permanent linear expansion, with little or no decrease in specific gravity but an increase in porosity. This permanent expansion may be about one-half per cent even below 1000°C and considerably more at cone 9. The toughness may appreciably alter in consequence. The further burning to cone 14–16 alters the expansion curve, changing the quartz completely or partially, according to the nature of the raw material and the time and temp. of burning, into cristobalite. This means that the sudden α- to β-quartz expansion between 500 and 600°C is replaced by the α- to β-cristobalite expansion between 200 and 300°C. The total reversible expansion is not lessened. The furnace of "cristobalite" bricks is therefore much less subject to expansion strain at dull redness than one of "quartz" bricks, although more so below 300°C. Neither is at all sensitive above 600°C. Long exposure in use at high temp. completes the conversion of quartz to cristobalite. Apart from actual test in the expansion apparatus, the authors have found that a detn. of the true sp. gr. of the powdered brick is the best guide to its behavior as regards expansion and contraction. In the discussion it was claimed (by Arthur Acton) that the detn. of the true sp. gr. of the powdered brick is a guide to the possible vol. changes in the brick during its use, but only in so far as bricks of about the same lime content are being compared. Comparison of powder densities of bricks with 1.5, 2.0, 3.0 and 5.0% of lime indicate that with high lime content powder densities as low as 2.30 are compatible with the presence of unchanged quartz. H. F. S.

37. China clay. St. Austell. *Quarry & Surv. & Contractors' Jour.*, **27,** 290 (1922).—The lessening of dependence upon manual labor is discussed. Before the war a few works had introduced hydraulic hoses for washing the clay, it being found that the enormous pressure of water obtainable by this method was sufficient to wash the clay without the aid of men to break it up first. Various methods of removing overburden, and shaft and tunnel working. No new methods described. O. P. R. O.

38. Clay in India. L. L. Fermor. *Geol. Surv. of India: Records*, **53,** 256(1922).—In Rajmahal hills there are valuable deposits both of china-clay and of fire clay. The

china-clay occurs in 3 ways, *viz.*, (*a*) as the decompn. product of feldspar in the fundamental gneisses and schists; (*b*) in the white Damuda sandstone, where its presence is due to the decomposition of feldspar originally present in the sandstone, and (*c*) as beds of white china-clay interbedded with white Damuda sandstone. The principal bed of kaolin of the first mode of occurrence is 40–100 ft. thick. In the second mode of occurrence the china-clay is extracted from the sandstone by crushing, washing and settling; the china-clays of the second and third occurrence are used by the Calcutta Pottery Works. In addition, fire clays are found in beds ranging from 1 to 15 ft. thick in numerous localities in coal fields. O. P. R. O.

39. Kaolin deposits in Finland. ANON. *Jour. Royal Soc. Arts*, **70**, 526(1922).—Investigations concerning the extent of kaolin deposits in Finland show very favorable results. The deposits are 4 to 6 m. deep; in some places the stratification is over 10 m. deep, and it has been noticed that the deeper stratification furnished the better kaolin. According to German experts, this kaolin is of excellent quality, clearer and better than elsewhere in Europe; and the china made from it is entirely white. O. P. R. O.

40. Ferro-silicon from feldspar. EDITORIAL. *Iron & Steel of Canada*, **5**, 154 (1922).—Potash of feldspar has been made available for human use in Sweden. Most of the processes have failed because they aimed at the recovery of the potash in the mineral, which is at best but 13 or 14% of its bulk. A commercially pure potash feldspar will contain 65% silica, 18% alumina and 13% potash, the remainder being mainly soda. J. E. Johnson, Jr., in 1920 applied for U. S. patents that described the manuf. in the elec. furnace of ferro-silicon from potash feldspar and scrap iron, the potash to be volatilized by the extreme temp. of the furnace and the fume caught and condensed. The Swedish process is similar, but simpler. Ferro-silicon is made from the same ingredients, but the potash is not volatilized and remains in the slag in combination with the alumina and other slag-making ingredients of the charge. This slag, from which the potash is readily dissolved, is ground and applied directly to the fields as fertilizer, presenting an excellent opportunity to Canadian manuf. of ferro-silicon. The large bodies of potash feldspar readily accessible and the cheap hydro-elec. power available for manuf. would point the way for one more Canadian industry. O. P. R. O.

41. The clays of Mercer County. SAMUEL M. SHARKEY. *N. J. Ceramist*, **1** [2], 131–6(1921).—A brief description of the important clay areas in New Jersey, with particular reference to Mercer County deposits and their uses. C. W. PARMELEE

42. Specific gravity and refraction of the potash-soda-feldspars. D. BYELVANKIN. *Bull. Petrograd Polytech. Inst.*, **24**, 437–52(1915); *Mineralog. Abstracts*, **1**, 89–90.—Analyses of K-Na feldspars from the literature showed no relations between compn., sp. gr.,

	I	II	III	IV
SiO_2	64.00	65.33	63.67	66.46
Al_2O_3	19.25	18.82	19.60	18.89
Fe_2O_3	....	....	....	0.75
BaO	0.41	....	0.98	....
CaO	0.15	0.39	0.40	0.61
Na_2O	1.86	4.23	3.62	7.68
K_2O	14.01	10.20	11.16	5.17
Ign.	0.50	0.78	0.33	0.69
Sum	100.18%	99.75%	99.76%	100.25%
Sp. gr.	2.570	2.582	2.595	2.606
α	1.5191	1.5219	1.5223	1.5255
β	1.5228	1.5257	1.5260	1.531
γ	1.5249	1.5275	1.5283	1.532

and n_D. New detns. were made, and the sp. gr. and n, calcd. for the K-Na portion when plotted against $Ab\%$, fall in a straight line. The results are shown on preceding page. (I) adularia, St. Gothard; (II) orthoclase, Ceylon; (III) microcline-microperthite, Savelev ravine, Ilmen Mts.; (IV) anorthoclase, Berkum, Rhine. E. F. H. (*C. A.*)

43. Modified method for the detection of tin. H. Heller. *Z. anal. Chem.*, **57**, 180–2(1922).—Treat 1 cc. of the soln. to be tested with 0.5 cc. of 5% KI soln., and introduce 1 cc. of strong H_2SO_4, by means of a pipet, below the surface of the liquid so as to form a second layer. If Sn is present small characteristic yellow crystals of Sn iodide begin to sep. at the surface between the two layers. The ppt. is sol. in HCl, which should therefore be kept at a min. in the test soln. As and Sb interfere with the test. J. S. C. I. (*C. A.*)

44. Physical chemistry and ceramics. E. W. Washburn. *J. Franklin Inst.*, **193**, 749–73(1922).—Sections are devoted to: colloid chemistry and ceramics; heterogeneous equil. at high temps. including the dissociation of kaolin and phase-rule diagrams; properties of silicate solns. at high temps., including soly. of gases, viscosity, density, and elec. cond.; high temp. calorimetry; and standard methods of testing ceramic materials. See *Ceram. Abs.*, **1**, 226(1922). Joseph S. Hepburn (*C. A.*)

45. The titration of zinc. E. Monasch. *Pharm. Weekblad*, **58**, 1652(1921).—The thiocyanate method of Kolthoff and van Dijk (*C. A.*, **15**, 3047) has been applied to the estn. of Zn in alloys. The potassium mercuric thiocyanate soln. is prepd. by dissolving 23.7 g. of $Hg(CNS)_2$ in a concd. aq. soln. of 14.4 g. of KCNS, and is stable for many months. Compds. of all the common metals interfere, but ferric and Al salts do not affect the reaction. Since M. uses Al in the sepn. of Zn from alloys, the method is suitable for the estns., but Fe salts must first be oxidized by means of peroxide. J. C. S. (*C. A.*)

46. Colloid chemistry. Jerome Alexander. *J. Ind. Eng. Chem.*, **14**, 800–2 (1922).—Colloid chemistry is a distinct zone in the chem. field. Many theoretical and tech. applications are given. No new data or theories are presented. F. E. Brown (*C. A.*)

47. Chemical reactions on surfaces. Irving Langmuir. *Gen. Elec. Rev.*, **25**, 445–54(1922).—See *C. A.* **16**, 7. C. G. F. (*C. A.*)

48. Volumetric estimation of potassium. Macheleidt. *Woch. Brau.*, **39**, 23–4 (1922).—Prep. a standard soln. of NaH tartrate by dissolving 60 g. of tartaric acid and 16 g. of NaOH in water and dil. to 1 l. Add 6 g. of KH tartrate and shake the soln. for several hrs. Filter off 30 cc. and titrate with 0.1 *N* $Ba(OH)_2$ soln. Shake a second 30 cc. for 1 to 2 hrs. with 0.5–0.75 g. of the salt mixt. to be tested, filter the soln. into a tared basin and, without washing the filter, titrate with the $Ba(OH)_2$ soln. Weigh the soln. before and after filtering, and make allowance for the loss. The difference between the two titrations is calcd. to K_2O. J. C. S. (*C. A.*)

49. Chemical constitution of zeolites. G. Tschermak. *Sitzb. Akad. Wiss. Wien*, **126**, 541–606(1917); **127**, 177–289(1918).—Twenty-one new analyses are given of various zeolites. In all cases the ratio Al : Ca(Sr, Ba) + $Na_2(K_2)$ is 2 : 1. Omitting O all zeolites may be represented by the formulas $Si_xAl_2CaH_{2y}$ and $Si_zAl_2Na_2H_{2v}$, where x and z range from 2 to 10, and y and v from 2 to 9. Or again, neglecting H, they all contain a group $Si_2Al_2CaO_8$ or $Si_2Al_2Na_2O_8$. This group is regarded as a nucleus ("Kern") and represented as *Kc* or *Kn*, respectively (also *Kb* and *Ks* for the corresponding Ba and Sr nuclei). The various zeolites are regarded as compds. of one or other of these nuclei with a silicic acid, combined H_2O and water of crystn. The silicic acid and water of hydration are supposed to form a network enclosing the nuclei. Such a structure is regarded as offering an explanation of the variation of the optical characters of the

zeolites with loss or gain of water, the various adsorption phenomena, and the ease with which the bases may be replaced. The following is a summary of the different groups: *A*. Orthosilicates in combination with SiH_4 and H_2O: Natrolite, SiH_4Kn = $Si_3Al_2Na_2H_4O_{12}$. Scolecite, SiH_4KcOH_2 = $Si_3Al_2CaH_6O_{13}$. Mesolite, a double salt of these two in the ratio 1 : 2. Edingtonite, SiH_4KbOH_2, aq. = $Si_3Al_2BaH_8O_{14}$. Gismondine, $H_2OKcO_2H_4$, aq. = $Si_2Al_2CaH_8O_{12}$, also with SiH_4 in place of H_2O. Laumontite, SiH_4KcSiH_2 = $Si_4Al_2CaH_8O_{16}$. Thomsonite, a double salt of the compds. H_2OKnOH_2 aq. and H_2OKcOH_2 in the ratio 1 : 3; also in the latter SiH_4 in place of H_2O. *B*. Disilicates combined with polysilicic acids and H_2O: Analcite, Si_2H_4Kn = $Si_4Al_2Na_2H_4O_{12}$, also with Si_4H_8, Si_4H_4, or H_2O in place of Si_2H_4. Faujasite, $Si_4H_8KcO_2H_4$. 4aq. also with Si_2H_4. Chabazite, $Si_2H_4KcO_2H_4$. 2aq. = $Si_4Al_2CaH_{12}O_{18}$, also with Si_4H_8, Si_2H_2, or SiH_4. Gmelinite with *Kn* in place of *Kc*. Levynite like chabazite with Si_2H_2 and SiH_2. Stilbite, $Si_4H_8KcOH_2$. 2aq. = $Si_6Al_2CaH_{14}O_{23}$, also with Si_6H_{12}, Si_4H_4, or Si_2H_4. Harmotome with *Kb* instead of *Kc*. Phillipsite like stilbite but with Si_2H_4, Si_2H_2, SiH_4, SiH_2. Heulandite, $Si_4H_4KcO_2H_4$. aq. = $Si_6Al_2CaH_{10}O_{21}$, also with Si_6H_6, Si_4H_8, or Si_2H_4. Brewsterite with *Ks* in place of *Kc*. Mordenite like heulandite with Si_3H_8. J. C. S. (*C. A.*)

50. Recent advances in science—geology. G. W. Tyrrell. *Sci. Progress*, **17**, 35(1922).—Sections are devoted to recent work on the chemistry of metamorphic rock and on volcanology. Joseph S. Hepburn (*C. A.*)

51. Recent advances in science—mineralogy. Alexander Scott. *Sci. Progress*, **17**, 41–6(1922).—Review of recent work in mineralogical chemistry. See *Ceram. Abs.*, **1**, 160(1922). Joseph S. Hepburn (*C. A.*)

52. Theory of Brownian movement. G. Jäger. *Sitzb. Akad. Wiss. Wien*, (2*a*), **128**, 1271, 1298(1919).—Stokes's law is held to be inapplicable in the case of Brownian movement. It is shown from consideration of mech. examples that if this law holds, osmotic pressure must be exerted as a continuous force and the consequences of Einstein's equation for Brownian movement and the calcn. of mol. size from diffusion are justified. The distribution of energy for particles of any no. of mols. may be obtained from Maxwell's law directly by gradual building up of groups from mols. The velocity of particles relative to the liquid medium, including their Brownian movement, is only to a small degree dependent on their mass. J. C. S. (*C. A.*)

53. Some fundamental conceptions of colloidal chemistry. Electrical charge on particles and the new conception of "micelle." Richard Zsigmondy. *Z. physik. Chem.*, **101**, 292–322(1922).—A discussion. H. Jermain Creighton (*C. A.*)

54. Determination of calorific value of coal. F. S. Sinnatt and M. B. Craven. Lancs. Cheshire Coal Research Assoc., *Bull.* **10**, 23 pp.(1921).—Formulas for the calcn. of calorific value from the proximate analysis of coal (cf. Goutal, *Compt. rend.*, **135**, 477–9(1902)) are accurate when dealing with samples from the same seam except when the coal contains Ca or substituted Ca carbonates; the value for one of the samples should be detd. in a bomb calorimeter, the manipulation of which is described in detail. J. S. C. I. (*C. A.*)

Refractories and Furnaces

55. Quartz and flint in America. R. Rieke. *Trans. Ger. Ceram. Soc.*, **2**, 168 (1921).—Comparisons of quartz and flint as used in the American and German ceramic industries were made by measuring the rapidity of change to cristobalite when heated to 1430°C in a porcelain kiln by noting the lowering of the sp. gr. (cristobalite = 2.32). The results tabulated follow:

		Sp. gr. before burning	Sp. gr. after burning
Amer. Mat.	Silica Sand	2.67	2.49
	Quartz Rock	2.66	2.49
	Flint Pebbles	2.57	2.28
	Chalcedony	2.66	2.32
Germ. Mat.	Norwegian Quartz Rock	2.65	2.37
	Hohenbocka Silica Sand	2.65	2.59
	Flint (German)	2.63	2.23

These results indicate that care should be used in applying the results of American research to German raw materials. FRED A. WHITAKER

56. Grinding broken saggers. ANON. *Brick Pot. Trade Jour.*, **30**, 208-9(1922).—Good grog should have angular grains and be free from dust. An edge runner mill with a solid pan should be avoided as this has a tendency to produce round grains and considerable dust. A cylinder grinder with pebbles or balls should also be avoided as the rubbing action in this grinder produces an excess of dust. The various pendulum mills are also open to the same objection. Jaw crushers are excellent preliminary crushers but do not work economically when required to reduce all the pieces to less than $^1/_2$" in diam. Crushing rolls are excellent for reducing material from pieces not more than 1" in diam. to the required fineness. It is generally desirable to use two sets of rolls, one to reduce to $^1/_8$" and the other to finish the grinding. Specially designed edge-runner mills with revolving perforated pans can be used. They are more costly to maintain than crushing rolls. Ball mills with sepg. devices which remove the material as soon as it is crushed may also be employed. They should be fed with material not more than $1^1/_2$" in diam. Stamping mills are not efficient and are too noisy. Disintegrators consisting of a series of hammer bars mounted radially on a horizontal shaft are the best for crushing grog. They require to be fed with pieces not more than 2" in diam. A sieve is desirable to remove the coarse and fine grog with any grinder in order to produce a grog of max. quality. H. G. SCHURECHT

57. The volatilization of silica in the manufacture of refractories in electric furnaces. RI. *Deut. Töp. Zieg. Ztg.*, **53**, 221–2(1922).—Amorphous SiO_2 containing 99.15% hydrated silica and which deformed at cone 35 was placed in a crucible and heated in an elec. fur. in an oxidizing atmos. at cone 39. No appreciable volatilization was noticed. When this same SiO_2 was placed in coke blocks and heated in the same fur. the SiO_2 volatilized rapidly and was deposited in the cooler portions of the kiln. Similar expts. were made on a number of substances and the ingredients which volatilized detd. by chem. analysis (see Table I). I is a fusible brick clay; II a feldspar, III a second grade fire clay, IV a good fire clay, and V a highly refractory kaolin. VI, VII, and VIII are mixts. of kaolin with MgO, CaO and K_2O. In all cases the SiO_2 volatilized more than the Al_2O_3. The alkalies volatilized more than the SiO_2. The product which condensed on the cooler portions of the kiln was composed principally of K_2O and SiO_2 with small amts. of Al_2O_3 and CaO. The volatilization of SiO_2 in a reducing atmos. is explained by reduction of the SiO_2 which would liberate the extremely volatile Si. H. G. SCHURECHT

58. Basic slag manufacture, Great Britain. ANON. *Chem. Age*, **7**, 315(1922).—According to an interim rept. just made to the Minister of Agric. there is some likelihood of their being a diminution in the supplies of basic slag next season. The rept. is made by a permanent Comm. appointed by the Minister to consider the development and improvement of the manuf. of basic slag and the extension of its use, and it contains a record of their expts. and results during last year. The demand for ground basic slag by the farmers of the United Kingdom has doubled since 1912. Production

TABLE I

	I		II		III		IV		V		VI		VII		VIII	
	Burned	Melted	Burned	Melted	Burned	Melted	Burned	Melted	Burned	Melted	Burned	Melted	Burned	Melted	Burned	Melted
SiO_2	64.91	64.01	65.48	64.97	72.82	68.71	59.59	53.23	55.05	50.37	51.76	43.85	51.40	50.67	51.83	48.49
Al_2O_3	11.90	14.81	19.00	20.86	21.48	26.40	33.90	41.65	41.56	46.94	39.07	43.71	38.80	41.04	39.22	46.21
Fe_2O_3	17.39	16.39	0.28	0.21	2.00	1.78	2.76	1.90	1.25	1.06	1.17	0.68	1.17	1.20	1.18	1.07
Mn_2O_3	2.09	2.45	...	...	...	...	...	...	...	...	...	...	...	...	...	...
CaO	1.09	0.99	0.50	0.25	0.68	.4	0.38	tr.	0.50	0.23	0.47	tr.	7.11	6.79	0.48	0.11
MgO	1.40	1.11	0.39	0.38	1.11	0.98	0.96	0.87	0.29	0.34	6.52	11.70	0.25	0.20	0.24	0.34
K_2O	0.92	0.13	14.22	13.06	2.27	1.96	2.61	1.95	1.06	0.75	1.28	0.35	1.24	0.32	7.48	3.61
Na_2O	...	...	0.36	0.21	...	...	...	...	...	...	...	...	...	...	...	...
Cone	3	2–3	14	16	28	27	32	35	35	37–38	15	14	27–28	26	28	35–36

has not likewise increased and in 1920 and 1921 was considerably less than the demands. There has been a reduction in quality owing to the supersession of the Bessemer process by the open-hearth process. The slag now obtainable contains only half the percentages of phosphate of pre-war days, and much of it shows reduced soly. The demand has been met to some extent by importation but it is likely that the quality of basic slag manufd. on the continent may decrease, as it has in the United Kingdom, as a result of a similar change in process. With regard to the possibilities of increased or improved production, there has been little change in blast-furnace or steel-furnace procedure as for the purpose of improving either the output or the quality of slag. From the steel makers' point of view, basic slag is relatively unimportant. The practical result is that the compn. of basic slag is detd. by the conditions under which the steel-maker is working, and the total amt. producible is regulated by the demand for steel. The use of such substitutes as ground mineral phosphates would afford a ready means of solving the problem. The fertilizing value of these phosphates is being investigated. It is proved that high sol. open-hearth basic slags have the same agricultural value per unit of phosphoric acid as the old Bessemer slags and that low sol. slags and mineral phosphates have a smaller value. The Comm. express the hope that they may ultimately be able to map out the country into regions where the high sol. slag can effectively be replaced by low sol. slags and mineral phosphates. They also hope to ascertain whether very low grade slag could be used with an admixture of mineral phosphates. The rept. concludes with the suggestion that the official soly. test needs revision.

O. P. R. O.

59. One piece furnace lining. I. S. Pieters. *Iron & Steel of Canada*, **5**, 156 (1922).—Discusses the merits of the one-piece monolithic lining for refractory fur. compared with the brick lining. In the former there are no joints to cause weakness, to serve as channels for cold air to enter the fur.; no bricks to loosen and fall out; no cement to fuse and disappear and no unequal expansion and contraction. There is no chem. action between different substances. The lining material is chosen for its ability to withstand heat and fur. conditions. The life of the fur. has been increased up to 500%, reducing the cost of upkeep proportionally. It has enabled boilers to operate for more than a year and sometimes for 2 yrs. without a shut down for fur. repairs where with brick, a new lining was required several times a year. It has increased combustion efficiency thus lowering the cost of fuel. Boiler evapn. has been increased economically far beyond the range formerly possible with economy.

O. P. R. O.

60. Graphite in Canada. V. L. Eardley-Wilmot. *Can. Inst. Min. & Met. Trans.*, **26**, 124(1922).—For commercial purposes, it is convenient to distinguish three varieties of graphite: crystalline, flake and amorphous. Flake graphite occurs disseminated through the containing rock, whereas the crystalline forms true veins of more or less compact graphite. Amorphous graphite approaches coal in its physical characters, and is often found in contact with coal seams, shales and slates. Graphite mining in Canada is confined to the provinces of Ontario and Quebec. E.-W. describes finishing and polishing, and flotation systems. Samples of Canadian graphite were submitted to all known crucible makers, but the general verdict was that although from the chemical standpoint Canadian graphites are as good as, or even better than the Ceylon graphite, they are inferior in physical characters. Re-floating in the Callow cells, followed by careful tabling and screening, has produced an 80-mesh, 87 to 90% concentrate, distinctly more angular, and denser than ordinary "finished" products. These samples have been submitted to crucible makers who reported this "natural" flake as good in every way as the best Ceylon graphite, and that it could be used in the crucible industry. Graphite mills and operations are described. O. P. R. O.

61. Fire brick. ANON. *Industrial Canada*, **23**, 94(1922).—A hitherto unknown industry in Canada is to be established by the Canadian By-products Co. Ltd., at Hamilton. They purpose mfg. fire brick, fireproof building brick and tile, under 4 basic patents. The plant will have a capacity of 20,000 fire brick and miscellaneous refractories and will be able to supply the demand hitherto supplied by importation from U. S. and Scotland. O. P. R. O.

62. Notes on jointing materials for refractories. L. BRADSHAW AND W. EMERY. *Trans. Ceram. Soc.* (Eng.), **21**, 107–16(1922).—In general, the jointing material used for laying fire clay bricks consists of a mixt. of ground raw clay and grog, with or without sand, while for silica bricks, crushed silica with a small propn. of fire clay is employed. It is well known that the softening temp. of silica fire clay mixt. is lower than that of either constituent. The authors found that the curve for fusion points of mixt. of finely crushed silica brick and fire brick corresponded roughly to Seger's curve for pure silica. When tested under load of 35 lbs. per sq. in., the values fall into the same order as those of the ordinary refractoriness, but the curve is steeper on the silica side and flatter on the fire clay side, *i. e.*, the differences between the softening temp. with and without load are less in the case of siliceous mixt. than for mixt. rich in fire clay. The softening point under load of 100% fire clay brick grog was cone 20. The introduction of 40% silica brick lowered the softening point only to cone 19. When coarser grained mixts. are substituted for those used in the foregoing experiments, the effect upon the softening point is less marked. In the prepn. of mortars for fire clay bricks, the addition of grog to fire clay is a general practice. The grading of sizes and proportioning of the materials used are of prime importance. The effect of mixing carefully graded materials in various propn. was studied. The coarsest grade used all passed 20-mesh. When the material has a high contraction, cracks develop during the air-drying, while in other cases they appear only after firing. These cracks are invariably transverse, *i. e.*, across the joint, owing to the shrinkage along its length. Longitudinal cracks generally do not appear. A briquette of fine clay forms a hard compact mass free from cracks, which offers very high resistance to crushing and slag penetration. The same clay, after firing between bricks, exhibits large fissures into which slag can penetrate freely. The sharp increase in the contraction of the clay with diminishing grain size of clay was clearly shown, as also the corresponding increase in mechanical strength and the resistance to slag penetration. The addition of grog largely reduces the contraction and allows a greater penetration of slag. Of the mixt. examd., those composed of mixed grades of clay and grog appear to give the best results. These mixts. are mechanically strong, have a sufficiently small contraction, and set between bricks to a hard compact mass, which is free from cracks and is not easily attacked by molten slags. The addition of sand diminishes the fire-shrinkage, but renders the mixt. friable. It is evident that the prepn. of a suitable mortar is mainly a question of balancing the opposing qualities of its constituents. H. F. S.

63. The influence of oxidizing and reducing atmospheres on refractory materials. L. BRADSHAW AND W. EMERY. *Trans. Ceram. Soc.* (Eng.), **21**, 116–52(1922).—Seger cones heated in a current of coal gas remained erect at temps. far above their normal softening points. These cones were found to consist merely of a hollow shell with a quantity of slag discharged at the base, or of a semi-vitrified mass covered with an infusible skin. The outer shell is extremely refractory. The effects are observed not only in the lower cones containing borax frit, but also in the higher ranges of cones which are free from borax and other volatile matter and also free from iron. It appears to be due to the formation of a thin film of hard carbon in intimate contact with the surface of the cone. It has been found possible to drain off the slag from the interior, leaving the outer shell intact. The cone is mounted over a hole of suitable size bored

through a thin refractory plate which forms the lid of a hollow cylinder of the same material. On heating in a current of coal gas to a temp. considerably above the normal softening point of the cone, the viscous material is discharged into the receptacle below, while the refractory shell remains standing and appears from the outside unaltered. The surface deposition of hard carbon is also observed with test pieces of fire clay brick heated in an atmosphere of coal gas. The refractoriness of the shell is so very much higher than that of the untreated material that if the fact can be applied practically, it should be possible to make a super-refractory from the purer clays. The imparted refractoriness might not endure under working conditions. H. F. S.

64. Graphite in Siberia. ANON. *Raw Materials Rev.* (London), **1,** 155(1922).—As the result of various hydrographical and geological expeditions which recently investigated parts of Siberia, deposits of graphite have been found on the River Kureiki, a tributary of the Yenisei. These are estd. to contain at least 200,000,000 roods, or enough to satisfy the requirements of the world for several decades. Deposits of graphite have also been noted along the River Podkamennoi Tunguske, together with extensive measures of coal and cupreous nickel ores. O. P. R. O.

65. Illinois fire clays. C. W. PARMELEE AND C. R. SCHROYER. Illinois State Geol. Surv., Ext. from *Bull.* **38,** 149 pp.(1921).—A proposed new classification of clays according to use includes: I, clays burning white or cream colored, not calcareous; IA, open burning, porous at cone 15; IB, dense burning, non-porous or nearly so at cone 10–15; IC, dense burning, non-porous or nearly so at cone 5–10; II, buff burning clays; IIA, refractory; IIB, non-refractory; III, clays burning red, brown, or other dark color; IIIA, open burning, not attaining low porosity until near or at the fusing point; IIIB, dense burning with a more or less extended vitrification range; IV, clays burning dirty white, cream or yellowish white. Further subdivisions are given and the typical uses for the different classes are given. The various types of clays are described and methods of conducting the physical tests are detailed. The geology of Illinois clays is reviewed and many deposits are described. Judged by their physical properties the samples are classified as follows: refractory clays showing a porosity of 5% or less at cone 9 or under, 20; refractory clays showing porosity of over 5% below cone 9, 30; stoneware clays, 48; architectural terra cotta clays, 53; sewer pipe clays, 9; face brick clays, 45; common brick, tile, etc., clays, 10; sanitary ware clays, 48. The same clay may appear in more than one of the above classes. C. H. KERR (*C. A.*)

PATENTS

66. Insulating cement or mortar. ARTHUR S. ELSENBAST and WALTER J. JORDAN. U. S. 1,421,192, June 27, 1922. An insulating cement comprising powdered diatomaceous earth, clay, and starch. C. M. S., JR.

67. Composition for producing coatings on refractory articles. WILLIAM ROY MOTT. 1,425,603, Aug. 15, 1922. As a new article of manufacture, a refractory article provided with a coating comprising an oxy-compd. of boron, associated with iron and chromium. C. M. S., JR.

68. Refractory silica brick and process of manufacture. ORAZIO REBUFFAT. Italy. 1,420,284, June 20, 1922. The process of rapid conversion of quartz into its allotropic varieties of lower specific gravity by incorporating therein small quantities of the radicals of acids nonvolatile at high temperature and calcining the same and recovering the allotropic varieties of the quartz of lower specific gravity than quartz. Cf. *Jour. Amer. Ceram. Soc.*, **4,** 945(1922). C. M. S., JR.

BOOK

69. SEXTON, A. HUMBOLDT: **Fuels and Refractory Materials.** Revized and enlarged edition. Edited by W. B. Davidson. New York: Van Nostrand Co. 382 pp. $4. Reviewed in *Am. Gas J.*, **116,** 561(1922). (*C. A.*)

Abrasives

70. Greek emery exports. ANON. *Oil and Colour Trade Jour.*, **62,** 615(1922).—The export of emery stone is yearly increasing in importance. O. P. R. O.

71. Bauxite in India. L. L. FERMOR. *Geol. Surv. of India, Records,* **53,** 250(1922).—Extensive deposits of bauxite have been found in India, which compare in quantity very favorably with the Irish, French and American bauxites. In order of importance these deposits are located in the Provinces of Bombay, Bihar and Orissa. The analyses given indicate these bauxites are of great economic value. O. P. R. O.

72. Corundum in the Northern and Eastern Transvaal. A. L. HALL. Union of S. Africa, *Geol. Surv., Memoir,* **15,** 1920.—In a region of 200 sq. mi., corundum occurs in several forms: (1) crystal corundum, found in loose crystals in shallow alluvial deposits, (2) boulder corundum in loose blocks embedded in a matrix, and more resistant to weathering, (3) reef corundum, in vertical veins intrusive in the basic formation, and commonly a few feet or yards thick. In the Plateau region the corundiferous reefs are felspathic while in the low country reefs are characterized by margarite instead of feldspar. The crystal, boulder and reef corundums have been exploited commercially, with very favorable results. Large quantities of corundum are available and for commercial plumasite or marundite ore bodies, a corundum content of from 30 to 60% is a conservative estimate. In the absence of nepheline and allied alkaline rocks, the Transvaal fields are not comparable to the Ontario corundum-bearing localities, but they show many points of resemblance to those of the eastern U. S., and to certain deposits in Natal. From the economic point of view, the S. African corundum fields are the most extensive and richest in the world. The deposits contain the makings of a valuable industry, notwithstanding the severe competition of artificial abrasives. Among the conditions to be arrived at are (1) more uniform methods of grading, (2) maintaining a definite and high standard of purity, and (3) closer contact between producer and consumer. The export of graded corundum in grain form, instead of the present shipments of crystal corundum in different conditions of purity (freedom from gangue) would do much toward establishing a future corundum industry on a permanent economic footing, leading up to the manuf. of abrasive tools. Illus. and bibliography on corundum. O. P. R. O.

73. The east Adriatic bauxite. F. KERNER-MARILAUN. *Montan. Rundschau,* **14,** 73–8(1922).—A description of the geological occurrence and characteristics of several types of bauxite. R. S. DEAN (*C. A.*)

Stoneware, Whiteware and Porcelain

74. Porcelain fittings for wireless. ANON. *Times Trade Supp.* (London), **101,** 218(1922).—The development of wireless broadcasting and the popular demand for wireless receiving sets have called for elec. porcelain fittings of new and particularly exacting design. Practically every piece of elec. app. necessitates some porcelain fitting, so that all these provide some new business for elec. porcelain manuf. High-tension generating and distributing installations necessitate porcelain of greater durability and higher insulating property than formerly, and wireless plants require new types of insulators. English manufacturers are able to meet the demand effectually, in face of keen German competition. O. P. R. O.

75. The manufacture of pottery. ANON. *Brick. Pot. Trades Jour.*, **30,** 207–8 (1922).—Wet mixing is preferred to dry mixing. The ware is biscuited at 1100–1300°C in 45–70 hrs. and cooled in 48 hrs. Glost burn is at 900–1100°C and decoration is done at 600–850°C. H. G. SCHURECHT

76. The heating of a porcelain oven by means of fuel oil. J. Chauvisé. *Bull. officiel direction recherches sci. ind. inventions,* No. **32,** 326–39(June, 1922).—Satisfactory results have been obtained at the Manufacture Nationale de Sévres. A. P.-C. (*C. A.*)

77. Translucency of porcelain. W. Steger. *Trans. Ger. Ceram. Soc.* **2,** 9(1921).—By observing the increasing translucency of porcelain during burning a valuable check on the maturing process can be obtained. The translucency increases as the smaller sillimanite crystals are gradually merged into larger ones. The following methods of comparing translucency are described: (1) Hand method of judging the sharpness of the contour of the hand when held between the porcelain and the light. (2) Screen method (*Trans. Amer. Cer. Soc.,* **13,** 102(1911)). (3) Wedge method (*ibid.,* **17,** 150, (1915)). (4) Martens photometer (*ibid.,* **17,** 150(1915)). (5) Bouguer photometer. (6) Weber photometer. Fred A. Whitaker

78. The solubility of coloring metal oxides in china glazes. R. Riché and Ing. W. Poetsch. *Trans. Ger. Ceram. Soc.,* **2,** 77(1921).—In melting a glaze containing a metal oxide four possiblities present themselves: (1) Mechanical suspension of the oxide as such in the glaze instead of solution. (2) Solution under heat but crystn. during cooling. (3) Complete or partial crystn. if glaze is supersaturated. (4) Oxides react with the other components of the glaze to form silicates, borates, etc. The effect of various metal oxides in combination with 4 glazes of the following types was studied: (1) A soft lead, low alkali, boric acid glaze for cone 09. (2) A leadless boric acid glaze also for cone 09. (3) A harder glaze for cone 2*a* with only traces of boric acid. (4) A commercial leadless glaze for cone 2*a* containing no boric acid. It was established that the chem. compn. of the glaze rather than the m. p. detd. its capacity for dissolving oxides. Glazes low in Al_2O_3 showed the highest soly. The above combination of glazes and oxides was later ground fine and reburnt as glazes on a china body and in no case was there any sign of crazing. F. Kraze arranges the oxides as anti-crazing agents in the following order: Co, Cu, Cr, Mn, Fe, Zn, Ba, Ca, Mg, K, Na. In testing the oxides for properties as underglaze colors it was found that Cr_2O_3 showed the least soly. in all 4 glazes and gave the sharpest lines. Fred A. Whitaker

79. Translucency of porcelain. W. Steger. *Trans. Ger. Ceram. Soc.,* **2,** 63(1921).—Tests with simple porcelain bodies composed of kaolin, quartz and feldspar showed: (1) Translucency is inversely proportional to thickness. (2) Curves plotted to show the relationship between thickness and translucency of the different bodies form straight lines and run exactly parallel where ratio of quartz to feldspar is the same and the translucency increases as the clay substance content decreases. (3) By extending these to their intersection with the ordinate (thickness = 0) values were established and plotted against the clay substance content of these test bodies and again a straight line resulted. Supplementary tests with a more complicated porcelain containing ball clay gave a curve running almost parallel with those obtained with the test batches which led to the supposition that the ratio of quartz: feldspar was approximately the same as in these. Following this out as in (3) a theoretical clay substance content of 57% was indicated and later confirmed by rational analysis. This indicates the possibility of detg. the approx. rational analysis of a porcelain by measuring the translucency and comparing it with standard porcelains. Fred A. Whitaker

80. Malaya's new pottery industry. Anon. *Jour. Roy. Soc. Arts,* **70,** 676(1921).—This plant introduces an entirely new industry in the country. It is equipped to handle all the processes from refining the crude clay to the decoration of the completed piece and is situated about 16 mi. from Ipoh. Casting and jolleying are the processes used, permitting a comparatively large output with labor that is not yet thoroughly trained. Teapots, jugs, ewers and basins are already being turned out by Malay girls who had never seen a pottery until a few weeks ago. All the required materials are found within

3 mi. of the works and besides supplying its own clay the company ships china clay to cotton mills in Bombay and paper mills in Calcutta. The barrels for packing the product are also made at the works. O. P. R. O.

81. Fine grinding in the potteries. Editorial. *The Engineer* (London), **134,** 222(1922).—Alsing introduced the tube mill in 1870 for the grinding of calcined flints in the Staffordshire potteries. Inquiry shows us that the tube mill, which has come so much into favor in other industries, among which metallurgy and cement making may be mentioned, has really made but little progress in ousting its only rival, the wet chert mill, from local favor. The chief advantage lies in first cost. It is now not far short of 150 years since Brindley brought out the wet grinding mill or "pan," at the behest of Wedgwood, who had just initiated the use of flint in pottery, and decided upon the use of chert or hornstone as the abrasive medium. There is practically no difference in the design of the pans to be seen in operation today from those in use a century ago or at the time of their introduction. Only a few potters do their own grinding, which is a separate business carried out by milling firms. They buy the siliceous materials in bulk and sell them in the form of slop to the pottery manufacturers. The chert grinding is in the form of a mortar mill, 14 ft. diameter and 3 ft. high, the bottom being lined with chert blocks about 1 ft. thick. Over this bed 4 large blocks of chert called runners, fixed to 4 arms at right angles, revolve at a speed of 15 r. p. m. A common wt. for these runners is 16 cwt., though much heavier stones have been used. The pulp from these mills has to pass a 140-silk or wire mesh. The tube-mill has the advantage in first cost but it is not the mill proper which represents expense in the chert pan but the heavy gearing, a considerable amt. of power being required to start and run it. Almost as much is required for a tube mill of similar capacity at the start, but afterward the power required is considerably less than with the chert mill. Those who have installed the tube mill say that it effects an economy, but this does not seem to amt. to a great deal if the saving does not exceed one shilling per T. of material ground, as it is claimed. A point in favor of the tube mill has been brought about by the present high price of chert. The tube mill occupies less space than the older grinder and need not necessarily be put on the ground floor. Against the tube mill, is the heavy hand of certain potters, who specify in contract that slop be the product of the chert pan. As long as this preference exists there is no likelihood of the chert pan being scrapped in favor of its younger rival. For some time, both systems of grinding will be carried on in close propinquity. For the first time in its long existence an important grinding mill in the potteries has just had a tube mill erected close to its battery of chert mills, and the various verbal reports as to the relative economy of the systems will be added to by another based on carefully recorded data. The necessary facilities exist for making trials of the relative systems which may be taken as comparative and free from bias. With regard to the flints used in the tube mills, the Staffordshire millers are in a good position, as those best adapted for the purpose are selected from the heap awaiting calcination and grinding. An important attribute of chert as a grinding medium is that its gradual wearing down does not add any deleterious foreign matter to the flint, as would be the case if certain other stones were used. O. P. R. O.

82. Pottery. Anon. *Chem. Eng. & Min. Rev.*, **14,** 369(1922).—A unique display of W. Australia pottery was held in Perth recently. The exhibition comprised a most interesting collection of W. Australian pottery clays and a wide range of articles, from bricks to semi-porcelain ware, from glass bottles to Hume concrete pipes. O. P. R. O.

83. Spit-out of glazes on passing through an enamel kiln. Jno. Miles. *Trans. Ceram. Soc.* (Eng.), **21,** 208–26(1922).—Spit-out faults are really due to small bubbles of gas, which, coming chiefly from the pores of the body, pass through the glaze when the latter becomes viscous while in the enamel kiln, leaving the surface of the glaze

more or less rough. The gas is generally superheated steam generated from moisture in the body. If the glaze remains soft enough in the enamel fire for a sufficient length of time, these gases will make their exit and the glaze surface will become smooth. In drying ware before putting it into the enamel kiln, the point where the glaze is broken must be the topmost point of the piece. To reduce spit-out losses, it is necessary (1) to avoid flash firing in biscuit; (2) to fire the glaze well up in glost; (3) to avoid damp atmosphere and water in the glost warehouses, and (4) to allow no rushing in firing enamel, especially between 650 and 800°C. In the discussion it was claimed that other factors, in addition to steam, such as carbon, in the body might cause spit-out. H. F. S.

84. Closed circuit grinding. J. C. FARRANT. *Trans. Ceram. Soc.* (Eng.), **21,** 125–52.—"Closed circuit" signifies that the material which is insufficiently ground is sepd. out by a classifier and returned to the mill for regrinding. The system of closed circuit grinding applies both to wet and dry reduction. This paper deals particularly with the use of Hardinge mills for the grinding. Tests have shown that in closed circuit wet grinding: (*a*) if the balls or pebbles are large and speed of mill is high, crowding will appear at the finer sizes in oversize; (*b*) if the balls are small or the speed is low, crowding will appear at the coarser sizes in the oversize; (*c*) the product from a mill with large balls and high speed will be more uniform than the product from a mill with low speed and small balls. The author gives examples of the use of Hardinge mills in grinding iron ore, barytes and flint, then concludes: "In the foregoing examples, the finished products ground at the various plants were detd. more by the size of the largest particles than the amount of "slime" or "flour" that was produced. In grinding to the potters' requirements this method of detg. the critical grinding point will not hold good because it is necessary to produce a more or less fixed propn. of "slime" or exceedingly fine material, in addition to grinding through a given lawn. In order to meet the grinding requirements of the pottery trade, it will be necessary to feed the grinding mill at such a rate that a max. amt. of the desired product is obtained per h. p. H. F. S.

85. Factory preparation and burning of whiteware bodies. ARTHUR S. WATTS. *N. J. Ceramist,* **1** [2], 91–6(1921).—A discussion of the prepn. and burning of whiteware bodies covering briefly the following topics: (1) raw materials, (2) cleaning dirty ball clay, (3) mixing the body, (4) prepn. of stain. The author recommends the following as the correct propn.: to 750 oz. of pure water add 15 oz. pure cobalt sulfate and stir until dissolved. Then add 7.5 oz. carbonate of soda. The proper propn. of stain to body are: for a body contg. 10% ball clay, add 75 oz. of stain soln. to each 1500 lbs. of body. For bodies with higher ball clay content increase the stain addn. in the same ratio up to 15% ball clay. For stain in glazes add 10 oz. of stain to each 100 lbs. of dry glaze. Glazes high in lead require more stain. (*a*) *Sieves.*—Revolving sieves are less costly and do not clog so easily. (*b*) *Filter press pressure.*—Max. pressure should be 80 lbs. for a body free from ball clay. Add 2 lbs. for every 1% of ball clay present. When the press stops running water, increase the pressure 10 lbs. for a few min. (*c*) *Aging and its effect.*—The temp. of clay cellars should be kept above 80°F and the relative humidity should be 90°. Aging is bad for elec. porcelain since it gives rise to gas blebs in the body. (*d*) *Plasticity.*—Plastic clays are either "greasy" or "sticky." Eng. and Amer. clays differ in this respect. "Greasy" plasticity is preferable. (*e*) *Pug mills.*—A slow rate of pugging produces an open body. A faster rate produces a granular, weak body. Too much speed causes the clay to heat. (*f*) *Setting the kiln.*—The first and second rings should be set 1″ apart, except midway between the cuts, and the inside rings all set a like distance. Leave a 1-in. opening between all rings. Not more than 6″ should be left between the top of the bungs and the crown at any point.

In downdraft kilns, the center of the kiln may be set 12 to 15″ below the crown, and the burn improved if an opening is provided from top to bottom in center. (*g*) *Kiln firing.*—For burning hard-fire porcelain, free from ball clay, with the body biscuited, the glost fire may progress as fast as the coal will burn, maintaining a condition bordering on reduction from the time the kiln is hot enough to develop such a condition, *i. e.*, from about the tenth hour. For best results, the fuel beds must never burn low enough to leak any air, as a highly oxidizing condition is as dangerous as a condition of extreme reduction. The temp. is dropped fast after finish to an orange-red, then closed and cooled slowly. By this plan it is possible to burn a 16-ft. kiln to cone 15 in 20 hrs. (*h*) *For sanitary ware and elec. porcelain* the author gives the method of firing in considerable detail. C. W. PARMELEE

86. Zircon spark plug porcelain. G. A. PRITCHARD. *N. J. Ceramist*, **1** [2], 145–6(1921).—Porcelain made by the use of zirconium silicate has three important properties: high dielec. strength, great mechanical strength and great resistance to temp. changes. Zircon spark plugs have been heated to a temp. of 2400°F, and plunged into ice cold water without development of cracks. C. W. PARMELEE

87. The use of stain in bodies. C. W. PARMELEE. *N. J. Ceramist*, **1** [2], 117–25 (1921).—The principles involved in the correction of color of whiteware bodies by the choice of materials; use of reducing fire; use of stains. The compn. of stains, insoluble stains; use of cobalt salts, particularly the sulfate; general directions regarding the proper amt. of reagent necessary for pptn. of sol. cobalt salts in the body. C. W. P.

88. Sagger bodies and tests of same. W. STEGER. *Trans. Ger. Ceram. Soc.*, **2**, 142(1921).—Unusual ingredients mentioned are magnesite, corundum, zirconium oxide, carborundum. F. A. WHITAKER

89. Modern developments in German fine ceramic products, particularly in the manufacture of porcelain and faience. W. FUNK. *Z. angew. Chem.*, **35**, 81–3(1922).—A review and history with an outline of important problems to be solved, including the development of better fuels, better burning methods, the finding and using of new sources of feldspathic materials, the adaptation of German kaolins, the development of lower temp. hard porcelains which can be more economically produced, etc. C. H. K. (*C. A.*)

90. Dielectric strength of solid insulating materials. W. S. FLIGHT. *Elec. Rev.* (London), **90**, 39–41, 76–9(1922); *Science Abstracts*, **25B**, 157–8.—The author deals with the factors affecting the elec. strength of solid materials such as varnished cloth, micarta, mica paper, and flexible micanite. The following are touched upon: the test equipment; initial temp. of the insulation; thickness of insulation; shape of the insulating material; duration of application of voltage; thermal capacity of the electrodes; size and shape of electrodes; moisture content; tests carried out in air or in oil. Curves are given showing how the elec. strength varies with the no. of layers and also with the thickness of a fibrous material. The distribution across 3 layers of varnished cloth is plotted in the form of curves. The effect of time of application is illustrated by test curves on a micarta cylinder, oil-treated fuller-board, and varnished cloth. Test curves are also given showing the behavior of mica cambric under dry and humidified conditions. The author recommends that the temp. of the test sample and the electrodes should be approx. 90°. With reference to the length of time of application of the pressure, all figures should be based on the max. voltage that the material will withstand for one minute. This is detd. by first running up at the rate of 1 kilovolt per second and then attempting to apply 75% of the max. voltage for one minute. From the result of this second test the max. voltage the material will withstand for one minute can be ascertained. The area of the electrode should be 4 sq. in. Before testing, the test samples should be artificially dried and suspended for 24 hours in a humidifier at 25°. E. H. (*C. A.*)

PATENTS

91. Treatment of china clay or like clays. ANON. Pat. 183,535. *Chem. Age* (London), **7,** 320(1922).—A suspension of china clay in water is allowed to settle by gravity or is separated by mechanical means until it becomes a thick paste having a water content of about 50%. The material is then dried in an evapg. plant such as that described in Specification No. 149,055 (see *Chem. Age,* **3,** 292). In the drying plant the material is fed in a parallel series of thin films on to drying surfaces arranged in a number of chambers connected to operate in multiple effect. In this app. the drying surfaces are heated by vapor evolved from material being dried, the vapor being compressed to raise its temp. The process of drying the wet clay in blocks in a kiln by combustion gases is thus avoided, and the dry clay is obtained by a rapid and continuous method. O. P. R. O.

92. Preparing clay for making ceramic ware. G. W. LAPP. U. S. 1,424,924, Aug. 8. A slip is filter-pressed and the pressed cakes are subjected to pressure *in vacuo* to remove occluded air and gases. (*C. A.*)

93. Machine for working up ceramic masses into tiles, disks, and similar bodies. ERICH GERBEL. Germany. 1,420,093, June 20, 1922. In a machine for making disk-shaped objects and the like from ceramic masses, a vertically adjustable support for a mass block; means for truing the mass; means for successively cutting disks from the mass, and means for receiving and supporting the cut disks, the adjustable support and the disk cutting means being arranged for relative movement toward and from each other. C. M. S., JR.

Art and Design

94. Standardization of colors. H. TRILLICH. *Farben-Ztg.,* **27,** 672–4(1921).—See *Ceram. Abs.,* **1,** 256(1922). E. J. C. (*C. A.*)

95. Color standards. HANS HELLER. *Farben-Ztg.,* **27,** 2495–7(1922).—H. contests some of the suggestions of Trillich (see abstract above) and of Ostwald on the standard designation of colors. **Reply.** HEINRICH TRILLICH. *Ibid.,* 2556–7. (*C. A.*)

Heavy Clay Products

96. Elimination of waste-paving bricks. U. S. BUR. STANDARDS (Simplified Practice Recommendation No. 1), **1922.**—In accordance with the unanimous action of the joint conference of representatives of manufacturers, distributors, and users, the U. S. Department of Commerce, through the Bureau of Standards, recommends that recognized types and sizes of paving brick be reduced to the following list:

STANDARD SIZES AND VARIETIES

Standard Sizes

Width, inches	Depth, inches	Length, inches	Width, inches	Depth, inches	Length, inches
3	4	8½	3½	3½	8½
3½	4	8½	3½	3	8½

Standard Varieties

Plain wire-cut brick (vertical fiber lugless)			Repressed lug brick		
3	4	8½	3½	3½	8½
3½	4	8½	3½	4	8½

Vertical fiber lug brick			Wire-cut lug brick (Dunn)		
4	3	8½	3½	3	8½
4	3½	8½	3½	3½	8½
...	...	...	3½	4	8½

Hillside lug brick (Dunn)			Hillside lug brick (repressed)		
3½	4	8½	3½	4	8½

This recommendation describes the need for eliminating economic waste caused by the excessive variety in types and sizes of paving bricks, and shows the procedure used in reducing existing varieties from 66 to 7. The industry initiated the action through its trade association, and the Govt., through the Department of Commerce, endorses and publishes as its own those simplifications recommended by joint conferences of producers, distributors and users of the commodity. H. F. S.

97. Brick industry in New Brunswick. ANON. *Industrial Canada*, **23**, 72(1922).—An impetus has been given to the industry in N. Brunswick by the opening of a new plant at St. John, by the Stephen Brick Co. Modern equipment of the most efficient type has been installed. This includes a 150 h. p. engine and automatic machines for mixing clays, cutting brick, etc. Capacity will be between 50,000 and 60,000 bricks per day and there is an abundance of excellent clay alongside the plant. O. P. R. O.

98. Hollow building tile. WALTER A. HULL. *N. J. Ceramist*, **1** [2], 87–8(1921).—A brief abstract of an address describing work being done by the U. S. Bureau of Standards. C. W. PARMELEE

99. The "Pontam" system of paving. ANON. *Quarry & Surv. & Contractors' Journal* (London), **27** (1922).—This system was devised by the Société des Hauts Fourneaux et Fonderies, Pont-á-Mousson, France, and was first utilized 10 years ago; though the metal then employed was not so well suited as it is now, the roadway treated is still in perfect contition. The paving consists of (1) a layer of concrete of a depth varying between 0.1 m. and 0.2 m., according to the firmness of the ground on which it is laid, and (2) a layer of cement 1 cm. thick to level the concrete and take, before setting, a reinforcement of cast iron depressed pieces in the form illustrated below. This reinforcement is gently embedded in the cement, the depressions being placed downwards and so arranged as to resist sinking; the number of pieces laid range between 16 and 25 per sq. m., according to the traffic to be supported. Regularity in laying is ensured by means of a line, and uniformity of surface is maintained by templates and flat rulers placed on the materials. A surfacing of cement and small gravel (quartz or hard rock may be substituted) in the proportion of 0.8 kg. to 1 kg. of cement per cu. m., and a depth of 4 cm. covers the reinforcement. The surfacing has to be skilfully carried out in such a way as not to displace the reinforcement; it must also be done before the cement layer has completely set so that the two may be incorporated. Surface setting must take place gradually; under a hot sun the concrete is covered with old sacking, which can be watered now and then, likewise in winter, frost has to be guarded against. This mode of paving has many advantages. In the first place it can be fitted to all degrees of traffic, in the second it is non-slipping and non-tripping, the small part of the reinforcement at the surface running diagonally to the roadway, and it is very economical with regard to maintenance, being by French computation,

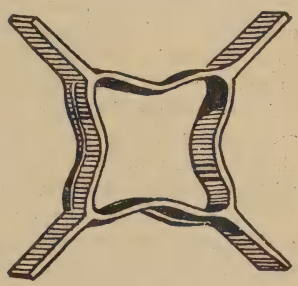

FIG. 1.

from 25 to 35% cheaper to maintain than other paving. Up to the present no roadways with this reinforced concrete paving have yet been opened for pipe laying, etc. In trench making, special care would, of course, have to be taken to conserve the symmetry of the reinforcement, because a number of pieces would necessarily be broken in the excavation, and their replacement requires time and skill. O. P. R. O.

100. The manufacture of tiles in East Africa. ANON. *Bull. Imperial Inst.*, **19**, [3], 297–311(1921).—The provision of roofing material for buildings in the tropics is often a matter of some difficulty. Corrugated iron is largely employed but is costly, and tends to make the building unbearably hot. In several countries in Africa it has been suggested that roofing tiles should be made locally, and search has been made for suitable materials. Specimens of clay and sand, collected in Uganda, and of clay, shale and diatomite from Kenya Colony, have recently been examd. at the Imperial Institute, and the results of the investigation are given in the present article. As diatomite does not seem to have been used hitherto for making roofing tiles, the trials now reported are of special interest. O. P. R. O.

101. Economical use of fuel in the manufacture of brick. GUNTHER. *Arch. Wärmewirtschaft*, **6**, 114–6(1922).—Brick are fired in the Hoffmann continuous kilns to a large extent in Germany. The customary manner in firing these is to throw coal in through holes in the crown from which it is allowed to fall to the bottom through spaces left between the brick underneath the holes. In a new method of firing these kilns, G. sets the brick so the coal does not always fall to the bottom of the kiln but it drops on brick grates placed at different elevations in the kiln. Thus the coal instead of burning at the bottom of the kilns burns in the middle and at $^3/_4$ of its height as well as at the bottom. These positions are clearly shown by diagrams. This method permits more uniform heat distribution in the kilns, better draft, increased production and economy in fuel. It was claimed that by changing from the old method of firing to the new that the time of firing was reduced 12%. The production was increased 15% in one case, 30% in a second and 40% in a third. A saving of 25–40% fuel was also obtained. H. G. SCHURECHT

102. The reddish brown color of sewer pipe. ANON. *Taschenbuch für Keramiker, Keram. Rund.*, **30**, 26–8(1922).—The firing of sewer pipe may be divided into 4 periods. In the 1st period the mechanical and chem. water is driven off and the bituminous matter oxidized. During this process the ware is fired with open fire causing an excess of air to be present in the kiln. In the 2nd period the kiln atm. becomes reducing due to the increase in temp. which necessitates a reduction of the incoming air. This changes the red iron compds. to the blue-gray forms. In the 3rd period the ware starts to shrink and vitrify when the rate of firing is gradually decreased. During this part of the burn the salt is introduced either in one round or three rounds. The salt can also be mixed with the coal and the mixt. fired during this period. The 4th period is the one in which the desirable reddish brown color is developed. In finishing the kiln all fires must extinguish about the same time. As the fires die down the kiln atm. becomes richly oxidizing due to the influx of air. The fire holes are then plastered up to keep the ware at high temps. with this oxidizing atm. as long as possible. This changes the blue-gray glaze to the desirable reddish brown color. If the fire holes are closed before the fire has completely burned, the remaining coal will burn with a strongly reducing smoke, causing the soot to combine with the glaze. This produces the dark glaze but not the desirable reddish brown glaze. This step requires a burner with considerable ability. If the coal is allowed to burn up entirely before the fire holes are closed it may allow too much cold air in, which would cool the kiln down below a point where it will not develop the reddish brown color but will cause the pipe to have a glaze which is too light in color. In order to det. the proper time to plaster up the fire holes a peep hole is placed just above

the fire door about 1″ in diam. By removing a plug one can observe exactly when the last of the coal has burned after which the fire holes should be closed. It may be necessary to handle different kiln slightly differently to produce the same results but when this has once been detd. the same conditions may be reproduced in later burns. It is also important to watch the draft gauge during the first 24 hrs. after the kiln has been finished and duplicate the best of these conditions in later burns. H. G. SCHURECHT

103. Blisters on sewer pipe. S. *Deut. Töp. Zieg. Ztg.*, **53**, 205, 206(1922).—One can often notice lump-like blisters on both the inside and outside of salt glazed sewer pipe. If broken open a hollow space is usually found underneath the blister. Similar blisters are often found in brick and are in this case attributed to the bituminous matter in the clay which has not been thoroughly oxidized before the outside of the brick vitrified. Since extremely plastic clays are used for making sewer pipe which are difficult to oxidize it seems probable that this may be the cause of some of the blisters on pipe. It is often claimed that these blisters are due to pyrites in the clay. The effect produced by pyrites is different however since this mineral causes small wart-like projections on sewer pipe. Clays often contain small amounts of H_2SO_4 which may also cause these blisters. Sulphates decompose liberating a gas before the ware is entirely matured which would cause the pipe to swell where these gases cannot escape. Firing with a reducing kiln atm. will decompose these sulphates at a lower temp. and hence reduce this trouble. In tracing the cause of blisters in a sewer-pipe factory it is well to start in the prepn. room. Entrapped air in pipe will often cause blisters before the pipes are fired. Insufficient pugging and storage of the pugged clay are often responsible for these blisters. If the clay is not thoroughly pugged it will contain considerable air which will be liberated as a blister in the subsequent pressing. Air thus entrapped will expand in drying causing the blister to swell up. If the clay is well pugged so it contains a uniform amt. of water throughout, if stored for some time after pugging and is fed into the press at regular intervals, little trouble due to blisters in the molding room will be encountered. H. G. SCHURECHT

104. The discoloration of brick. ANON. *Brick Pottery Trade Jour.*, **30**, 183–9 (1922).—Discoloration of brick may be caused by sol. sulphates of Na, K, Ca and Mg. Yellow and green colorations are sometimes due to V salts and are comparatively rare for though the salts are present in min. quantities in many clays there is seldom sufficient to cause trouble. This discoloration is not as easy to prevent as that due to sulphates. Firing in a reducing atmos. will reduce it. A further cause of this trouble is the salts introduced by stacking the brick on ground contg. ashes and occasionally by stacking them on concrete. In each case no harm is done when everything is dry but the trouble results when the ground or concrete is wet. H. G. SCHURECHT

PATENTS

105. Building brick. BERNARD F. WEBER. U. S. 1,425,302, Aug. 8, 1922. A composite wall or the like, comprising courses of hollow stretcher bricks with corner hollow header bricks all substantially the same size, and binder courses of the hollow header bricks, each stretcher and header brick presenting four plane unbroken surfaces, each stretcher brick having a web extending longitudinally therethrough and each header brick having two transverse webs extending from side to side. C. M. S., JR.

106. Paving block. CHARLES L. SULLIVAN and JOHN D. FLETCHER. U. S. 1,422,193, July 11, 1922. A paving block comprising a base and a tread portion, the tread portion being narrower than the base portion and provided with an intervening longitudinally disposed furrow and with central extensions from opposite ends of the block. C. M. S., JR.

107. Brickmaking. GEORGE A. WARNER. U. S. 1,420,796, June 27, 1922. In a molding apparatus for forming bricks or similar articles, the combination of a mold

box provided with a plurality of compartments and having side walls that are corrugated or fluted, and a member having matching corrugations or flutings that can be passed over the mold box to corrugate the plastic bricks. C. M. S., Jr.

108. Tile construction. Eugene Ceriat. U. S. 1,420,020, June 20, 1922. In a tile structure, units having L-shaped cross-section, the longer of the shanks forming the outer and inner surface of the structure, the shorter of the shanks forming the engaging members between the surfaces, the longer shanks having means to engage for forming flush outside surfaces, the shorter shanks having cut-out portions to form horizontal passages in each of the layers of the structure, the shorter shanks being also disposed in spaced relation to one another to form vertical passages for ventilation, reenforcing rods embedded between the several layers in the structure, and other reenforcing rods disposed through the shorter shanks for connecting and reenforcing the structure vertically. C. M. S., Jr.

109. Slag-brick machine. Charles T. Bray. U. S. 1,420,018, June 20, 1922 A slag brick machine including a horizontal rotary distributor provided at one end with an opening to receive slag from a furnace and having at the other end a plurality of circumferentially spaced outlets adapted to be successively brought to the bottom of the distributor for discharging the slag, an endless conveyor arranged to carry successively a plurality of molds beneath the discharging outlets, gearing connected with the conveyor and the rotary distributor, a friction disk connected with the gearing for actuating the same, a drive shaft having a flexible coupling, a friction wheel mounted on the drive shaft and arranged to engage the friction disk and adapted to be carried into and out of engagement with the same by the flexing of the drive shaft, means for adjusting the friction wheel, a rock shaft having an arm provided with a bearing receiving the drive shaft, and means for partially rotating the rock shaft to engage the friction wheel and to carry it out of such engagement and to vary the frictional engagement. C. M. S., Jr.

110. Interlocking brick. Guy M. Bean. U. S. 1,420,810, June 27, 1922. A brick having a tapered projection and a correspondingly shaped socket at one face and arranged end to end and located inwardly of the edges of the face of the brick. C. M. S., Jr.

111. Brick-scoring mechanism. William F. Richey. U. S. 1,418,880, June 6, 1922. A mechanism for scoring the faces of bricks or blocks prior to the baking thereof comprising a fixed rest, standards disposed respectively on opposite sides of the rest and interconnected at their upper ends to provide a frame, rotary combs disposed on opposite sides of the rest and between it and the standards, the combs being provided with shafts, brackets in which the shafts of the combs are rotatably mounted, the brackets being provided with threaded shanks extending through longitudinal slots formed in the standards, clamping nuts carried by the threaded shanks and engaging the standards on opposite faces to provide for vertical adjustment of the brackets, a transverse shaft having geared connections with the shafts of the combs, flexible means for imparting rotary motion to the transverse shaft, and adjustable bearing brackets in which the transverse shaft is journaled. C. M. S., Jr.

112. Method and means for brick hacking. James B. Ladd. U. S. 1,418,658, June 6, 1922. The method of loading and hacking bricks, which consists in the following steps, moving bricks in the direction of their length, bringing the bricks to rest abutted end to end in rows greater in length than a car, assembling the rows in parallel relationship, sufficient in number to form a layer the full width of the car, and transferring to the car at one operation such part of the assembled rows as shall form a complete layer for the car. C. M. S., Jr.

113. Tile for floor structures. Julius H. Toupet. U. S. reissue 115,369, May 30, 1922. In a building structure, a hollow tile having a top wall consisting of an arched

span increased in thickness from its center towards each side, whereby pressure thereon will be converted into lateral thrust and grooves extending through the exterior faces of the side walls into the thickened portions of the arched span. C. M. S., Jr.

114. Apparatus for molding hollow bodies. Percy A. E. Armstrong. U. S. 1,416,927, May 23, 1922. Apparatus for casting hollow bodies, comprising a mechanically strong core center and a plurality of collapsible mold core sections centered directly upon and supported by the member. C. M. S., Jr.

115. Process and machine for making bricks. William H. Haws. U. S. 1,425,010, Aug. 8, 1922. The process of molding bricks from brick forming material, which consists in supplying a mold with an excess of material, compressing portions of the material near the walls of the mold with greater force than the material removed from the walls, while relieving pressure on the last mentioned portion of the material, then finally compressing all the material. C. M. S., Jr.

116. Interlocking tile. Frank Dochnal. U. S. 1,425,181, Aug. 8, 1922. An interlocking tile comprising a perforated body having its inner face provided with three facial ribs, the intermediate rib extending beyond the plane of the other two ribs. C. M. S., Jr.

117. Brick cleaning machine. Samuel M. Funk. U. S. 1,424,719, Aug. 1, 1922. A cleaning machine including conveyors alongside of one another, cleaning surfaces at opposite sides of one of the conveyors, an abutment element beyond the cleaning surfaces for guiding the articles to be cleaned on to the second of the conveyors and turning the articles over upon a cleaned side, and a second set of cleaning surfaces at opposite sides of the second conveyor beyond the abutment element. C. M. S., Jr.

118. Superlocking hollow tile. Otis V. Neese, Flo L. Neese and Earl C. Neese. U. S. 1,424,372, Aug. 1, 1922. A superlocking hollow tile block comprising a pair of equal-sized hollow sections, one section extending beyond one end and the side adjoining that end of the remaining section, the sections having interposed thickened walls for spacing the sections apart, and the walls extending and being reduced beyond the overlapped portions of the two sections, the reduced portions of the walls being integral with the opposite sections at opposite ends of the block. C. M. S., Jr.

119. Brick. John Edward Evans. U. S. 1,422,949, July 18, 1922. A brick comprising a body portion, a flange on the inner edge of a side of the body portion, a recess formed on the inner edge of the opposite side of the body portion adapted to receive the aforementioned flange of a contiguous brick in a structure, a groove formed in the periphery of the body portion on one of the sides, a wedging tongue on the periphery of the opposite side adapted to be received in the aforementioned groove of a contiguous brick in a structure, the flange being provided with an opening to receive a nail or other fastening extending diagonally therethrough in the general direction of the side of the brick remote from the flange. C. M. S., Jr.

Glass

120. Some properties of lime-magnesia glasses and their commercial application. II. S. English and W. E. S. Turner. *J. Soc. Glass Tech.*, **20**, 357–63(1921).—*The annealing temp. and expansion coeff.* of the series of glasses described in Part I, are given. The annealing temp. for the lime-magnesia glasses is considerably lower than for the corresponding glasses contg. only lime or magnesia. The coeff. of expansion decreases continuously from 8.44 to 7.54 $\times 10^{-6}$ as CaO is replaced by MgO. The advantage of the addition of MgO to the batch was now clear. Possible cheap commercial sources of magnesia are discussed. The probable advantage of adding small amounts of alumina to the lime-magnesia batch was suggested. G. S. Fulcher

121. Measurement of small variations of refractive index throughout meltings of optical glass. A. J. Dalladay and F. Twyman. *J. Soc. Glass Tech.*, **20,** 325–30 (1921).—To test the homogeneity of a melt, a number of samples, about $^1/_{10}$″ thick, were polished flat, placed in optical contact, heated until they became a solid block, and then ground and polished perpendicular to the plane of the samples. When such a composite block is placed in the path of one of the beams of a Michelson interferometer, the central black band will be shifted different amts. by the different samples if they are not of the same index of refraction. Differences of one in the sixth decimal place can thus be readily measured. Results of some tests are given. G. S. Fulcher

122. A suggested method for the determination of the absolute viscosity of molten glass. Irvine Masson, L. F. Gilbert and H. Buckley. *J. Soc. Glass Tech.*, **20,** 337–41(1921).—If the rate of fall of a metal ball were detd. by taking a series of X-ray photographs, the viscosity could be computed from Stoke's equation as corrected by Ladenburg. The method was tested with glycerine syrups and results accurate to about 1% were obtained. By making measurements with balls of different d., such as platinum and nickel, the *d. of the glass* could also be detd. The method is obviously not applicable to lead glasses. G. S. Fulcher

123. The relative advantages and disadvantages of limestone, burnt lime, and slaked lime as constituents of common glass batches containing soda-ash and salt-cake. Anon. *J. Soc. Glass Tech.*, **20,** 341–5(1921).—*Discussion* of article by F. W. Hodkin and W. E. S. Turner in same journal, p. 188. G. S. Fulcher

124. Some properties of lime-magnesia glasses and their commercial application. I. Violet Dimbleby, F. W. Hodkin and W. E. S. Turner. *J. Soc. Glass Tech.*, **20,** 352–7(1921).—*The melting and lamp working properties* of a series of 7 soda glasses with mol. compn. 6 SiO_2, 1.2 Na_2O, 0.8(CaO + MgO), in which the MgO content was varied up to 6.5% and the CaO content decreased, correspondingly, from 9.2 to 0%. It was found that as the CaO is replaced by MgO, readier melting, easier working and less devitrification is obtained up to 2.6% MgO, but with 3.6% or more MgO, the glass is less easy to melt and to work than the pure soda-lime glass. G. S. Fulcher

125. The effect of the rays from radium, X-rays and ultra-violet rays on glass. J. R. Clarke. *J. Soc. Glass Tech.*, **5,** 155–65(1921).—Results previously obtained by Doelter and others for various glasses and allied substances are summarized. In order to ascertain the *effect of selenium and cobalt oxide on the coloration of soda-lime glasses*, 3 glasses contg. up to 0.13% of selenium and three with up to 0.004% cobalt oxide were exposed to the various radiations. X-rays, ultra-violet rays and γ-rays produced no effect with the exposures tried but β-rays colored the glasses brown, to a depth equal to the range of the rays. With prolonged exposure the coloration increased to a max. which was darker the greater the amt. of coloring agent present, and then remained constant. The pure soda-lime glass was not affected by the β-rays but was slightly colored on the surface by the α-rays. All the glasses showed *fluorescence*, due chiefly to the α-rays, but the colored glasses alone showed a marked fatigue effect after reaching maximum coloration. All the glasses after exposure to the emanation showed *thermo-luminescence* with disappearance of color after longer or shorter heating at 100°, 160° and 235°. It is believed that the coloring of the glasses is due to the formation of colloidal particles, perhaps by the action of the rays on dissociated ions present in the glass. H. P. Hood

126. On the quantitative study of technical problems in the glass industry. W. Travers. *J. Soc. Glass Tech.*, **5,** 124–33(1921).—Presidential address. A plea for well-planned research and quantitative methods of attacking problems relating to the glass house. H. P. Hood

127. The thermal expansion of glasses containing aluminium. S. English and

W. E. S. Turner. *J. Soc. Glass Tech.*, **5**, 183–7(1921).—Soda and soda-lime glasses contg. considerable propns. of aluminium have comparatively low thermal expansions. On the basis of mol. compn. Al_2O_3 reduces the expansion most, MgO less, and CaO least of the 3 oxides, when substituted for soda in tri-silicate glasses. On the basis of wt., however, MgO has much the greatest effect, lime and alumina being of about equal value. Owing to the acidic properties assumed by Al_2O_3 at times it is pointed out that it may not substitute sodium oxide in exactly the same way as calcium or magnesium oxide. H. P. Hood

128. The relative advantages and disadvantages of limestone, burnt lime, and slaked lime as constituents of common glass batches containing soda-ash and salt cake. I. F. W. Hodkin and W. E. S. Turner. *J. Soc. Glass Tech.*, **5**, 188–94 (1921).—Limestone is the cheapest of the three and affords mechanical stirring during glass melting. Limes are unpleasant to handle and change in wt. due to absorption of various amts. of moisture and CO_2. A number of crucible melts were made to det. effect on rate of melting and on the fluidity of the resultant glasses of corresponding amts. of limestone, burnt lime and slaked lime. The source of soda was also changed to det. the effect of using soda-ash, soda cake or mixt. of the two. A batch composed of soda-ash and burnt lime melted in all cases faster than any other combination while at corresponding temps. it was also the most fluid. With soda-ash, slaked lime offers a higher melting rate than limestone, while with soda cake limestone gives the higher rate. Glasses contg. salt cake and burnt lime are generally more viscous and melt the slowest. Between the three batch mixts., soda-ash-limestone, soda-ash-salt cake-limestone, and soda-ash-salt cake-lime there is less marked difference. The relative advantages offered by the three forms of lime may be markedly changed by changing the source of alkali, soda-ash or soda cake. Glasses made from soda cake alone tend to carry a slight scum. Soda cake or mixts. of the two sodas produced no such result. H. P. Hood

129. The effect of the joint presence of sodium and potassium on the solubility of lead glasses. The development of various types of glass. XI. C. J. Peddle. *J. Soc. Glass Tech.*, **5**, 195–201(1921).—It is found that the maximum durability in an alkali-lead silicate glass is obtained when the alkalies K_2O and Na_2O are mixed in the ratio of 7 to 3, and that the ratio holds good for all percentages of alkali below 20 and is furthermore independent of the amt. of SiO_2 or PbO in the glass. The substitution of PbO for SiO_2 improves the durability when the PbO is under 50%. In the alkali-RO-SiO_2 glasses where RO represents CaO, PbO, BaO, SrO, ZnO or MgO, when the total alkali present is less than 20%, the glass contg. both alkalies in equal propns. by wt. will be less sol. than either the glass contg. all its alkali as K_2O or all as Na_2O. Cf. *Ceram. Abs.*, **1**, 20, 81, 165–66(1922). H. P. Hood

130. Durability of optical glasses. Report on an investigation on the determination of the durability of optical glasses. T. Haigh. 51 pp. Pub. by British Scientific Research Association, London. Oct., **1921.**—Systematic study of tests used to determine durability and estimation of alkalinity, by the iodeosin reaction. Values of freshly fractured and weathered surfaces. Investigation of polished surfaces. Changes in the alkalinity of fractured surfaces with variations in the conditions of weathering. Influence of chem. compn. on the alkalinity of the surfaces. Durability as detd. from a visual examn. of the polished surfaces after autoclaving. Alkalinity of aqueous extracts of the glasses after autoclaving. Alkalinity of glass surfaces after autoclaving in steam. The dimming test. Retention of moisture by the glasses in the powdered form. Summary and microphotographs of "weathered surfaces." W. M. Clark

131. American factory successfully makes 40-inch telescope disc. Anon. *Glass Worker*, **41**, No. 45, 9, 29–30(1922).—The optical department of the Spencer Lens Co.

has completed the largest disc ever made in the U. S. This disc is 8 inches thick, weighs 900 lbs., and will be a part of the first all-American telescope. The glass is a borosilicate crown of low coeff. of expansion. Its compn. is SiO_2 70.8, K_2O 14.4, Na_2O 5.4, CaO 2.0, B_2O_3 7.2, As_2O_3 0.2. J. B. PATCH (*C. A.*)

132. The effect of absorbed gas on the conductivity of glass. V. BUSH AND L. H. CONNELL, JR. *Franklin Institute*, **194** [2], 231(1922).—Results show that gases in particular water vapor, penetrate throughout the vol. of glass and quartz and radically affect their vol. conductivity. Vol. resistivity of Corning G-702 glass was increased 6 times when heated in a vacuum. On exposure to air, resistivity decreased slowly but did not return to the original value. Pyrex glass and quartz was also tested showing similar results. R. J. MONTGOMERY

133. Making white flint glass in a tank furnace. F. W. ADAMS. *The Glass Worker*, **41** [50], 11(1922); *Pottery Gazette*.—Colorless glass to replace pale green glass requires purer materials. General discussion of tank, tank block, batch, decolorizers and annealing is given. R. J. MONTGOMERY

134. Note on the composition, or the comparative composition, of glasshouse pots made in the last fifty years. G. V. EVERS. *J. Soc. Glass Tech.*, **20**, 330–7(1921).—Some pieces of pot made by E. J. and J. Pearson of Stourbridge in 1868 and 1887 had come to light and had been compared with a pot made in 1921. The silica and alumina in the 1921 pot run 60 and 26% instead of 65 and 23% in the older pots, and though the alkali is somewhat higher, the refractory standard is, if anything, higher, and the porosity somewhat less. The importance of coöperation between the makers and users of pots in keeping accurate records of performance and properties is emphasized. G. S. FULCHER

135. Specifications for lime-flint glass tumblers. ANON. Bur. of Standards, *Circ.* **119.**—Specifications are given for a plain pressed hotel tumbler made of lime-flint glass. The items include the designation, measurements, material, quality, tolerance in size and weight, shock test, boiling test, acceptance, and sampling. They were formulated under the auspices of the Bureau of Standards and have been accepted by the Army, Navy and Marine Corps, Public Health Service, and General Supply Committee of the United States Government. At least 95% of the samples must pass all tests. The tests include 5 fillings with boiling water with sample at room temperature at the start (the shock test); and boiling for 6 hrs. to disclose any sign of corrosion, scumming, chipping or cracking (boiling test). Traces of color or bubbles if not unsightly are allowed but there must be no stones, cords, nor fine cracks. The dimensions, wt., and capacity, are specified with the min. and max. allowable for each. H. F. S.

136. Specifications for glass refractory materials. W. J. REES. *Jour. Soc. Glass Tech.*, **6**, 181(1922).—This is a critical review of the Provisional Specifications which were proposed about three years ago, by a Comm. of the Soc. of Glass Tech., after a consultation with representative manufacturers of refractory materials for the glass industry nominated by the Employers' National Council for the Clay Industries. Though these specifications have been used but little it will be generally agreed that the proposed specifications for silica bricks and blocks which have been made to comply with the specifications have given excellent results in practice. Sp. gr. of bricks; bonding ingredients and powder density; expansion; and mech. strength are discussed; also storage of refractories. Specifications for tank-blocks are dealt with at length. Specifications for pot clays are even more debatable than in the case of silica bricks and tank-blocks. Much discussion has taken place as to the relative merits of siliceous and aluminous clays for potmaking, but the factors other than chem. compn. of the clay which affect the durability of the pot may obscure the real issue. Two important properties of aluminous clays must receive consideration in connection with their use for

pot-making: their great contraction at high temp. and their low mech. strength at high temp., the latter factor causing bulging and often collapse of the pot. Siliceous clays have a much smaller contraction than aluminous clays, and pots made from them have a greater mech. strength at high temp. The maturing of pot clay and the drying of pots are two subjects on which extended investigation is desirable. Information is also required as to the relative thermal conductivities at glass-founding temp. of the various types of siliceous and aluminous clays. Progress in the production of pot clays is essential to the development of the glass industry. O. P. R. O.

137. Lime specifications for glass manufacture. R. R. SHIVELY. *Chem. Age* (N. Y.), **30,** 296; *Glass Industry,* **3,** 154–6(1922); cf. *C. A.,* **16,** 1139.—These specifications vary but little from those recently published. The quantity of Fe_2O_3 should be as low as possible, the general range being from 0.1% to 0.8% and should not vary more than 0.1% in various shipments. The Al_2O_3 and SiO_2 content is not objectionable but when once established the Al_2O_3 should not vary more than 0.5%, and the SiO_2 not more than 1% from the established compn. Fineness is an important factor governed entirely by local requirements. In large tanks coarse stone is preferred. If the tank is being worked to capacity it is believed that fine stone increases production. Unless otherwise specified all limestone and quicklime should pass a 20-mesh sieve. Lime causes 90% of the troubles in glassmaking arising from the batch materials, but much of the trouble commonly attributed to batch materials comes from other sources. J. B. PATCH (*C. A.*)

138. Optical problems in glassmaking. H. P. GAGE. *Phys. Rev.,* **15,** 247–8 (1920).—The phys. properties of glass are of the highest importance. The danger of unsuitable design of glass is illustrated by the use of curved instead of flat colored roundels in railway signals, thus obviating the possibility of an obscuring reflection produced by the powerful beams of elec. headlamps. The production of glasses possessing selective absorption and transmission of various wave lengths of light is of increasing importance. Demonstration of ultra-violet transmission and absorption of various glasses can be readily made with the aid of the fluorescence of an anthracene coated screen and the infra-red transmission by the ignition of ordinary typewriter carbon paper. J. B. PATCH (*C. A.*)

139. The coloration of glass by ultra-violet light. J. B. NATHANSON. *Phys. Rev.,* **17,** 408–9(1921).—A new type of glass was produced which when used for 400 hours as a globe for a Hg arc operating at about 87 watts showed no trace of coloration. An old type of glass similarly used developed a distinct purple color. J. B. P. (*C. A.*)

140. Glass technology. G. W. MOREY. *J. Ind. Eng. Chem.,* **14,** 823–4(1922).—Prominent among the recent advances in the glass industry are the improvements in the knowledge and technic of glass annealing, the studies of the relation of the phys. properties of glass to its chem. constitution, and the continued extension of the use of glass feeders and automatic machinery. Also noteworthy are the appearance of two new glass publications and the growth of the glass section of the Am. Ceramic Society. J. B. PATCH (*C. A.*)

141. The movement of molten glass in pots. H. W. HESS. *Glass Worker,* **41** [40], 11(1922).—During the melting of a filling of batch and cullet there is a positive motion of the mass after fusion has proceeded to a certain extent, much the same as the water in a boiler flows in a positive direction, due to the point of max. heating and the evolution of gases. Unequal heating of the pot may cause a circulation of glass which has been contaminated by the pot clay and thus spoil the melt. J. B. PATCH (*C. A.*)

142. Pyrex glass. OSKAR LECHER. *Chem.-Ztg.,* **46,** 469–70(1922).—An analysis is given as follows: SiO_2 80.71, B_2O_3 10.47, Al_2O_3 3.55, CaO 0.70, MgO 0.57, Na_2O 4.14. A similarity is claimed to the German glass 59 III. J. B. PATCH (*C. A.*)

143. The decomposition of the glass of ancient windows in the church of Thann. M. Battegay, G. Hugel and Th. Voltz. *Bull. soc. ind. Mulhouse*, **88**, 27–30(1922).—The glass consisted of a white and a red layer, the outer surface of the latter being covered with small, whitish, irregular cavities. The white substance in the cavities was shown to be $CaCO_3$ resulting from the slow decompn. of the glass under the action of light and humidity. The glass contained only 65.5% SiO_2. The alky. of the glass decreased its stability and the oxides (of Fe, Al, Cu, Mn, and Zn) which colored it acted as catalyzers to hasten the decompn. A. P.-C. (*C. A.*)

PATENTS

144. Machine for grinding beveled rim surfaces on spectacle glasses. Otto Henker. Germany. 1,422,055, July 4, 1922. In a machine for grinding beveled rim surfaces on spectacle glasses, a grindstone, a shaft rotatably disposed in a body and adapted to hold a spectacle glass, guiding means allowing to displace during the grinding operation the grindstone and the shaft relatively to one another, these guiding means forming with the shaft an angle which differs from 90°, and a cam coacting with a stop for limiting the relative displacement of the grindstone and the shaft, the angle contained by the stop and the guiding means being variable. Cf. *Ceram. Abs.*, **1**, 189(1922). C. M. S., Jr.

145. Method of producing nonshatterable glass. Otto S. Marckworth. U. S. 1,421,974, July 4, 1922. A method of producing nonshatterable glass comprising immersing assembled glass and celluloid laminae in a solution consisting of fusel oil, camphor and methyl salicylate while the solution is at a temperature between 24 degrees and 35°C, subsequently raising the temperature of the solution which has been applied to the laminae, applying pressure to the laminae, and subjecting the parts to a progressively increasing temperature during the pressure. C. M. S., Jr.

146. Closure for molten glass-outlets. Vergil Mulholland. U. S. 1,421,810, July 4, 1922. An insulating closure for the discharge outlet of a container for molten glass, comprising a holder provided with heat insulating material adapted to close the outlet, means for positioning the closure relative to the outlet, and means for yieldingly holding the closure against the outlet. C. M. S., Jr.

147. Method and apparatus for producing sheet-glass. Joseph E. Crowley and Clifford A. Rowley. U. S. 1,422,036, July 4, 1922. In an apparatus for continuously producing sheet glass, a source of molten glass, a pair of horizontal cylindrical metallic rollers having their cylindrical surfaces tinned, means for adjusting the rollers vertically, toward and from each other, means for internally cooling the rollers, means for rotating the rollers in opposite directions, a receptacle containing molten tin in which the lower portion of each roller revolves, means for flowing molten glass from the source into the trough between the rollers, the glass flowing through the slot formed by the contiguous surfaces of the rollers and emerging in the form of a downwardly moving sheet of glass, a heated chamber in which the rollers are located, having a slot in its lower side, and means for cooling the sheet as it emerges from the chamber. C. M. S., Jr.

148. Method and apparatus for the manufacture of glass. Robert Good. U. S. 1,421,210, June 27, 1922. The method of melting glass-making material which comprises introducing the material into a melting tank wherein the material is fed vertically down through the tank in a receptacle of conical shape, wherein by reason of the lessening diameter of the receptacle the material is subjected to an increasing temperature until fusion is effected and the material runs by gravity into the bath in the tank. C. M. S., Jr.

149. Sheet-glass-drawing apparatus and method for drawing glass. John R. Scohy. U. S. 1,420,868, June 27, 1922. The method of drawing sheet glass which

consists in drawing the glass substantially vertical in sheet form and maintaining the edges of the sheet substantially in parallel relation by feeding the glass to the edges through slotted bodies, turning the glass over a member, shearing the turned portion of the glass at a point near the member, and raising the member and the glass to form a succeeding sheet. C. M. S., Jr.

150. Automatic electric heating device for glass furnaces. Walter G. Clark. U. S. 1,420,181, June 20, 1922. An electrically operated heating device consisting of a multiple of heating units arranged in close proximity to the sheet of glass between the tank and the first supporting roller on a continuous window glass-making apparatus, together with a thermostat for automatically determining the amount of energy required in order to maintain the glass sheet at the proper degree of plasticity for successful operation, and means for removing and replacing the heating elements without interrupting the operation of the glass-making apparatus. C. M. S., Jr.

151. Glass cutter. Henry A. Ryther. U. S. 1,419,310, June 13, 1922. In a turret glass cutter which includes a turret-holder composed of a pair of spaced apart jaws and a clamping screw; a relatively thick wheel-carrying turret having counterbored cavities in one side intersecting the periphery of the turret so that each cavity has a mouth on the periphery, and integral studs located in the cavities, and supporting the usual glass-cutting wheels, the cavities being formed to protect the major portions of the wheels, and to permit other portions to project outward from the periphery of the turret, the thickness of the turret conforming to the space between the jaws, so that each side of the turret contacts with one of the jaws. C. M. S., Jr.

152. Apparatus for gathering glass from a molten mass Alfred C. Pilkington and Joseph Gaskill. England. 1,417,684, May 30, 1922. In apparatus for gathering glass, of the pipette type, an obturator adapted to contain a small quantity of glass, means operative to slide the obturator over the mouth of the pipette to open it, and an inner back edge on the obturator adapted, on so sliding the latter, to shear off from the glass in the mouth of the pipette, the small quantity of glass in the obturator. C. M. S., Jr.

153. Method of and apparatus for drawing glass. Clarence P. Byrnes. U. S. 1,425,746, Aug. 15, 1922. In the drawing of hollow glass articles from a tank or forehearth, the steps consisting in feeding air upwardly through the bath, baffling the air to retain distending pressure for the hollow glass body, while allowing baffled air to pass upwardly from within a floating ring by engaging its sides to continuously lift it. C. M. S., Jr.

154. Plate-glass annealing leer. Edwin E. Milner and William J. Lytle. U. S. 1,426,310, Aug. 15, 1922. A plate glass annealing leer having a plurality of muffle heating chambers arranged zig-zag with respect to each other, a plurality of heating flues in the top wall of each of the chambers, means for producing combustion for each of the flues, means common to all of the combustion-producing means in the side wall of each of the chambers, offtake means for each of the flues, and means for connecting all of the offtakes together. C. M. S., Jr.

155. Rotary glass cutter. Carl F. Doerr. U. S. 1,421,921, July 4, 1922. In a rotary glass cutter, a cutter bar, a sleeve adjustably fastened to the cutter bar, a cutter head provided with cutters arranged in spaced relation and projecting from the peripheral face of the cutter head, the latter being mounted to turn on and to slide on the sleeve to allow of adjusting the cutter head on the sleeve, and means securing the adjusted cutter head in place on the sleeve. C. M. S., Jr.

156. Rotary glass cutter. Carl F. Doerr. U. S. 1,424,625, Aug. 1, 1922. In a cutting implement having a plurality of cutters adapted to be brought selectively into cutting relation, embodying a cutter bar, a carrier sleeve longitudinally adjustable

thereon, a stationary abutment at one extremity thereof, an axially movable abutment thereon, a cutter head mounted for axial and rotary movement on the sleeve between the abutments having circumferentially spaced cutters projecting from the periphery thereof, and interengageable means on the confronting faces of the stationary abutment and the cutter head adapted to lock the elements against relative axial and rotary movement upon clamping engagement of the cutter head between the stationary and movable abutments. C. M. S., Jr.

157. Gauge glass. John H. Hanlon and Wm. J. Hanlon. U. S. 1,424,642, Aug. 1, 1922. In a water gauge for boilers the combination of a body having an opaque rear face and a sight opening closed by a cylindrical glass, the interior face of which is furnished with a plurality of projections disposed in a plurality of concentric circles, the projections being also disposed in such manner that they avoid straight line rows in any direction. C. M. S., Jr.

158. Obtaining glass. Jesse M. Said. U. S. 1,424,184, Aug. 1, 1922. In apparatus for delivering molten glass, the combination of a ladle mounted on a horizontal axis over a pool of glass, means for imparting movement to the ladle on its axis to cause it to enter the glass and obtain a quantity thereof, means for swinging the axis of the ladle to cause the ladle to clear the pool, means for inverting the ladle so as to discharge a quantity of glass therefrom, and means for returning the ladle to its position over the pool. C. M. S., Jr.

159. Manufacture of sheet glass. Henry F. Clark. U. S. 1,424,155, Aug. 1, 1922. The method of drawing glass sheets, consisting in drawing a sheet upwardly in a generally vertical direction, bending it over a bending device and moving it in a generally horizontal direction, and subjecting the lower surface of the sheet after it passes the bending device to the action of a heated jet. C. M. S., Jr.

160. Means for controlling discharge from glass tanks. Edward S. Hutton. U. S. 1,423,220, July 18, 1922. The combination of a glass tank and a discharge spout, with a wall between the lower part of the spout and the glass tank and an opening above the wall for the flow of glass from the tank to the spout, a floating block inside the glass tank with a transversely disposed passageway in the block arranged so that when the block is in one position against the wall, the passageway will extend from the lower part of the block to a point higher than the wall and permit the flow of the glass from the tank to the spout, and when the block is turned over will prevent such flow of glass C. M. S., Jr.

161. Sheet-glass drawing machine. Ora M. Cox and Connie C. Rose. U. S. 1,423,195, July 18, 1922. In a sheet glass drawing machine, a frame, a pair of spaced guides located at the opposite sides of the frame, superposed blocks slidably mounted in the guides, worm wheels rotatably carried by the frame, rotatable vertical shafts arranged in opposite sides of the frame, worms keyed to the shaft and meshing with the wheels, means for connecting the shafts together for synchronous movement, connecting rods operatively connected to the worm wheels and to the sliding blocks, movable arms carried by the sliding blocks, crank arms pivotally carried by the sliding block and connected to the movable clamping arm. C. M. S., Jr.

Enamels

PATENTS

162. Method of producing and applying enamel coatings to metallic surfaces. Herbert M. Smith. U. S. 1,425,612, Aug. 15, 1922. As a part of the process of enameling, applying an enamel mixture to a surface which is to be coated, thereby distributing the material over the surface, subjecting it to a fusion temperature and air blast thereto while the fusion is going on. C. M. S., Jr.

163. Method or process of removing enamel from enameled metal articles. WILLIAM E. PATCH. U. S. 1,416,865, May 23, 1922. The method of de-enameling enameled metal articles which consists in subjecting the article in a closed oven to a temperature above the original baking temperature. C. M. S., JR.

Cement, Lime and Plaster

164. Burning cement in two stages. C. DIDIER. *Brick Pot. Trade Jour.*, **30**, 205–6(1922).—In the first stage the cement is fired at 1000°C at which temp. the $CaCO_3$ is dissociated. It is then slaked with water and the impure portions removed by screening. This screened portion is then fired at a higher temp. which forms the sinter. Because of the increased cost of this process it is necessary to increase the selling price of this product over that made with one burning stage. H. G. SCHURECHT

165. Mineral resources of Guatemala. ANON. *Jour. Royal Soc. Arts* (London), **67**, 633(1919).—Limestone is found in great quantities throughout Guatemala. A siliceous volcanic ash is frequently found with the limestone, which can be roasted with the lime for the production of cement, resulting in a good grade product. Graphite and mica also occur in several places. A good grade of marble has been found in very large quantities. There are several salt springs. Large amts. of sulphur are brought to the market by the Indians, who extract the sulphur from the numerous vol. craters. Niter-bearing ground is found in numerous regions. Prospecting presents unusual difficulties because of the thick vegetation and the heavy volcanic ash, both of which hide the rock. With improved shipping facilities it may prove financially worth while to undertake the exploitation of several of these minerals. O. P. R. O.

166. A "blackboard" of soot and cement. ANON. *S. African Jour. Ind.*, **5**, 306(1922).—A new blackboard was constructed on a stone wall thoroughly cleaned, the joints were well raked out and wetted, and the first coat of cement plaster applied, consisting of 4 sand, 1 cement. A second coat of 3 to 1 and finished with a thin layer ($^1/_8$" thick) of neat cement and mineral black (soot from engine smoke-box) in the proportions of 1 bucket of cement to $^1/_4$ bucket soot, well mixed. The surface kept moist for a few days to prevent too rapid external drying. The result has been satisfactory, the blackboard being superior to the ordinary ones, less chalk being used and consequently less chalk dust being produced. A dead finish is obtained, making the writing on the blackboard easily seen from any angle. The soot does not stain the hands when the blackboard is being used. O. P. R. O.

167. Water tightness of concrete structures. H. C. RITCHIE. *Canadian Engineer*, **43**, 355(1922).—An interesting discussion of the whole question of concrete for water-holding structures read recently before the Institution of Water Engineers (London). A greater consideration of the tensile stresses in the concrete is urged. R. would limit the tensile stresses in the reinforcement steel to from 9,000 to 12,000 lb. per sq. in., depending upon the quality of the concrete, the percentage of reinforcement and the head of water on the structure being designed. He recommends that the direct tensile stress should not be allowed to exceed 10% of the ultimate compressive resistance of the concrete at 30 days. He advocates the deliberate localization of cracks through the placing of expansion joints at suitable places, particularly at planes of stoppage between successive day's work. The max. distance apart of these joints suggested is 25 to 30 ft. The advantage of complete sepn. of the bottom of a circular tank from the wall is also pointed out. By this device the restraining moment set up in the structure at the bottom of the wall is completely overcome, while at the same time there is no difficulty involved in making the structure water-tight. Such construction has been adopted with success in America with some comparatively large tanks. O. P. R. O.

168. Electric cement. ANON. *Times Trade Supplement*, **10,** 493(1922).—The new cement now known as "elec. cement" is manufd. by a process different from that adopted by the Lafarge Co. in the production of their "aluminous cement." The latter is made by a water-jacket process, while the elec. cement is produced by fusion of the raw materials in an elec. furnace. The main reason for the adoption of elec. was the high price of coal. The product has many advantages over ordinary Portland cement. The most noteworthy claims made for it are: (1) although slowsetting it hardens rapidly; its strength after 24 hrs. equals that of Portland cement after 28 days; (2) its ultimate strength being much greater than that of Portland cement, the safe working stresses can be increased to 3 times those now generally adopted; (3) it resists absolutely the action of sea water. These advantages are of sufficient importance to outweigh the higher cost of the material. Elec. cement cannot be used mixed with other varieties of cement or lime and great care must be taken when mixing it to see that all utensils have been thoroughly cleansed, so that no trace of lime or cement other than elec. cement remains in them. O. P. R. O.

169. High alumina cements. ANON. *Engineering* (London), **114,** 180(1922).—Experiments to find some binding material which would withstand the destructive action of sulphates in earths and water, on lime mortars and ordinary cements have resulted in producing high alumina cements, differing from Portland cement by valuable properties. Working on lines suggested by M. Vicat's conclusion that a cement for which the ratio (silica + alumina) : (lime + magnesia) is greater than 1, will resist the action of sea water, M. J. Bied began exptl. work with a view to increasing this ratio by raising the propn. of alumina. There are 4 aluminates of lime: $3CaO, Al_2O_3$; $5CaO\ 3Al_2O_3$; CaO, Al_2O_3; and $3CaO, 5Al_2O_3$. The first two of these are of little practical value owing to their extremely rapid setting in contact with water, but the last are valuable either pure or in the form of mixt. and in connection with these that the work has resulted in material of practical utility. In France the materials employed consist of bauxite, schist, limestone and slag. These ingredients are mixed, the mixt. is then melted in the cupola or elec. furnace, run off, cooled and reduced to powder. Normal analysis of the product shows about the following: silica, 10 to 12; alumina, 40 to 45; iron or oxide of iron, 10 to 20; lime, 35 to 40. The resulting material has properties differing in a marked degree from Portland cement. (1) The material does not decompose under the action of sea water, or in contact with earths or water contg. sulphates. (2) The material is slow setting, this action not commencing from 2 to 4 hrs. after mixing, so that ample time is secured for pouring and handling, and the adjustment of reinforcing bars. (3) The cement hardens so rapidly that at the end of a few hrs. the strength exceeds that of Portland cement after several weeks. Setting is accompanied by a considerable rise of temp., up to 175°C shortly after setting, while the action is said to proceed from the interior outwards. As typical of tests showing the characteristics of alumina cements we may give the following: in tests of pure cement of this class, with the standard test-piece a tensile strength of 33 kg. was obtained at 24 hrs., 59 kg. at 48 hrs., 64 kg. at 72 hrs., 67 kg. at 7 d., and 71 kg. in 28 days. A first-class Portland cement gave comparative figures of 10 kg., 22.5 kg., 33 kg., 50 kg., and 55.5 kg. respectively. A 1 : 3 mortar of high alumina cement gave, for similar periods, 29 kg., 34 kg., 35 kg., 36 kg., and 38 kg., the corresponding Portland cement mortar tests showing only 3 kg., 7.5 kg., 11 kg., 19.5 kg., and 27.5 kg. For concrete the superiority of the alumina cements is equally good, if not better than is shown by the above tests. For compression tests the results are even more interesting. In this case a block of neat alumina cement gave 470 kg. per sq. cm. at 24 hrs., 687 kg. at 48 hrs., 743 kg. at 72 hrs., 815 kg. at 7 days, and 959 kg. at 28 days compared with 70 kg., 141 kg., 264 kg., 456 kg., and 612 kg. for neat Portland cement. In the 1 : 3 mortar alumina cement

gave in compression 352 kg., 387 kg., 400 kg., 431 kg., and 475 kg., while Portland cement showed only 18 kg., 55 kg., 84 kg., 164 kg., and 287 kg. for similar periods. The increased strength of high alumina cements is thus very marked. On the Northern Railway of France these cements have been used for concrete buildings. No trouble has been found in effecting sound joints between new and old work. In the manuf. of concrete pipes, a repetition job, the fol. advantages have been found: (1) a reduction in forms, and increase of output, (2) a weaker mixt. has been possible with reduced thickness and less reinforcing, resulting in reduced finished wt. Pipes have been delivered and laid the day after pouring. For transmission line standards similar savings in time and wt. have been secured, where these standards have to be transported for erection into the heart of mountainous districts. The quick hardening properties make concretes of these cements suitable for pre-cast work, while pre-cast elements of ordinary reinforced concrete have been joined together in position with high alumina cements with success even in the case of tension members. This cement made it possible in a bank to convert rapidly a complete floor of small rooms into a series of halls with large clear floor spaces, and considerable spans. Spans of 18 m. were introduced without difficulty, though it would have been impossible to bring into the building and manoeuver into place girders of that length. Further, Portland cement reinforced concrete would have involved obstruction of the normal work too long a period. In this case the forms were removed in 48 hrs., and the whole job completed without interfering with office work on the 3 floors above. In districts where power is cheap the elec. fusion method of production has advantages. In many cases the overall savings have been well established, while the economy in time is often the detg. factor in the situation.

O. P. R. O.

170. Alumina cement, its development, use and manufacture. H. S. SPACKMAN. *Eng. News-Record,* **88,** 831–4(1922).—S. discusses the properties and use of high alumina cement as manufactured in France. J. C. WITT (*C. A.*)

171. Heat distribution in burning cement clinker. E. H. WHITLOCK AND C. E. BURGOON. *Concrete* (Cement Mill Section), **20,** 87–94(1922).—The authors studied the operation of a cement kiln by taking the temps. at various stations by pyrometers, measuring the draft, and analyzing the kiln gases and samples of the raw mix taken at various points in the kiln. They obtained some interesting data on the heat required for the various reactions taking place. They are of the opinion that it is possible to design a burner that would result in a saving of at least 25% of the coal now required.

J. C. WITT (*C. A.*)

172. Segregation as it applies to tanks as segregating or mixing devices. CHARLES CATLETT. *Concrete* (Cement Mill Section), **20,** 95–100(1922).—C. points out the importance of segregation in many mfg. processes and discusses some of the factors which influence it. He applies the results of his expts. particularly to the manuf. of cement and points out a no. of points at which segregation may be greatly diminished by the application of several elementary principles. J. C. WITT (*C. A.*)

173. Excess air in cement kilns. C. O. SANDSTROM. *Concrete* (Cement Mill Section), **20,** 112(1922).—S. discusses the quantity of air necessary for a cement kiln and states that he believes many kilns are operated with too much draft.

J. C. WITT (*C. A.*)

174. Asano Portland Cement Company of Japan. P. C. VAN ZANDT. *Concrete* (Cement Mill Section), **20,** 63–73(1922).—A description of the raw materials, equipment, mfg. processes, and the cement produced at the 7 plants of the Asano Portland Cement Company. J. C. WITT (*C. A.*)

175. Possibilities of fusion process for cement production. S. L. MEYERS. *Concrete* (Cement Mill Section), **20,** 105–7(1922).—M. states that the fusion process has

certain advantages in fuel economy not possessed by the sintering method, and that it does not present insurmountable difficulties. J. C. W. (*C. A.*)

176. Some causes of cracking and disintegration of Portland cement concrete. R. E. Stradling. *Concrete & Constr. Eng.*, **17**, 393–8, 475–80(1922).—S. states that the reasons for cracks and disintegration are very numerous, not well defined and in many cases not understood. In explaining the probable causes sometimes involved, he places them under 4 groups: (1) compn. and phys. state of the cement as received, (2) misuse of the cement, (3) compn. and phys. state of the aggregate employed, (4) conditions to which concrete is exposed. Under (1) he mentions the presence of "dead burnt" lime and magnesia and the possibility of this material slaking after the cement has been hydrated, sulfo-aluminates, and degree of grinding. Group 2 includes (*a*) setting time of cement and amt. of water used, (*b*) proportion of cement, (*c*) methods of molding; (3)—(*a*) water, (*b*) fine aggregate, (*c*) coarse aggregate, (*d*) artificial aggregates; (4)—(*a*) moisture, (*b*) electrolysis, (*c*) rusting of reinforcing steel. He concludes that by far the greater no. of failures are due to faulty workmanship or the condition to which the work is exposed. Only a few can be traced to bad materials.

J. C. Witt (*C. A.*)

177. Constitution and hydration of Portland cement. A. A. Klein. *Zement*, **10**, 636–8(1921); *Chimie et industrie*, **7**, 1150(1922).—A review of Richardson's theory of the constitution of cement and of Vicat's, LeChatelier's, Richardson's and the U. S. Bur. of Standards' theories of hydration. A. P.-C. (*C. A.*)

178. The use of slag cement in construction work. Kropf. *Zement*, **10**, 651–2 (1921); *Chimie et industrie*, **7**, 1150(1922).—Certain brands of slag cements are more sensitive to a strong premature desiccation than Portland cement; but in the presence of brine slag cement hardens more readily than many Portland cements. When properly sprinkled, it is suitable for elevated structures. Owing to the fineness of grinding, large quantities of sand can be added, and the resulting mortars are still relatively strong. Owing to its low CaO content, it is stronger than many Portlands. K. gives the compns. and methods of prepn. used in mining work, more particularly for filling up fissures in rock by injection. A. P.-C. (*C. A.*)

179. Lime-silica-iron oxide. H. Kühl. *Zement*, **10**, 361–4, 274–6(1921).—Alumina is not an essential component of hydraulic cements. The production of cements rich in iron oxide requires the presence of silica in a highly reactive form. The sintering of such cements is similar to that of Port. cement. The hydraulic constituent is tricalcium silicate. The area occupied by cements rich in iron oxide in a triaxial diagram of the system: lime–silica–iron oxide is in nearly the same position as that of the Port. cements in the system: lime–silica–alumina. J. S. C. I. (*C. A.*)

180. Hydraulic setting properties of basic blast-furnace slags. W. Krebs. *Zement*, **11**, 1–3, 15–17, 40–4(1922).—A long series of expts. and a study of the work of previous investigators have shown that all basic blast-furnace slags in a glassy, granulated state can be converted into hydraulic cements by the addition of alkali minerals and gypsum. Such cements harden better than is required by the (German) standard specification, and they are unaffected by 3 months' storage. J. S. C. I. (*C. A.*)

181. Standard and tentative methods of sampling and testing highway materials. U. S. Dept. Agr., *Bull.* **949**, 98 pp.(1921); *Expt. Sta. Record*, **45**, 891.—Standard specifications, as recommended and adopted by the second conference of State highway testing engineers and chemists at Washington, D. C., Feb. 23–27, 1920, are given. These include tests for both bituminous and nonbituminous road materials and tentative tests, as well as forms for recording and reprinting results. H. G. (*C. A.*)

PATENTS

182. Plastic composition. Earle E. Schumacher. U. S. 1,422,483, July 11,

1922. A plastic composition of approximately the following composition: Glycerine 4 parts, plaster of Paris 10 parts, water $1^1/_2$ parts. C. M. S., Jr.

183. Apparatus for forming concrete pipes. Daniel N. Trullinger and Leo A. Granger. U. S. 1,422,150, July 11, 1922. An apparatus for the purpose set forth comprising a shell, a core disposed longitudinally within the shell, a head supported upon the shell and adapted to travel longitudinally thereof and normally fitting around the front end of the core, and means whereby the shell, the head and the core may each be shifted longitudinally relative to the others. C. M. S., Jr.

184. Cement spreader. Charles J. Bellar. U. S. 1,419,537, June 13, 1922. A spreading machine comprising a receptacle having a distributing compartment at its bottom and wheels at its front within the compartment adapted to support the receptacle in a rolling movement over a floor. C. M. S., Jr.

185. Machine for mixing concrete ingredients or other substances. Frederick W. Kiddie. England. 1,419,737, June 13, 1922. For use in machines for mixing concrete ingredients or other substances, beaters mounted upon a shaft, each beater consisting of a single shank carrying a fork, and having chain form connecting means between the prongs of same, the shanks being inclined out of the radial lines, in order that the forks and chain form connecting means work the concrete endwise of the trough and more perfectly mix the concrete. C. M. S., Jr.

186. Insert for cement or similar floors. Charles H. Fay. U. S. 1,419,548, June 13, 1922. An insert for concrete or similar floors comprising a lower tubular member with an annular flange at the bottom, the flange having anchor elements on its top face, an upper tubular member with an annular flange, a metal sleeve between the flanges and enclosing the inner ends of the members, and means in one of the tubular members for supporting a pipe, the flange serving as a member for securing the support on entering so as to withstand the pouring of cement around the member. C. M. S., Jr.

187. Plastic composition. Kenneth L. Binkley. U. S. 1,418,905, June 6, 1922. A composition of matter comprising pitch and magnesium carbonate, the composition having a melting point of about 200°F. C. M. S., Jr.

188. Apparatus for making concrete bricks. Arthur G. Hatch. 1,425,590, Aug. 15, 1922. Apparatus for making concrete brick or the like, comprising a molding deck, spaced parallel septums of metal extending vertically from the deck, removable pallets fitted between the septums, the bodies of the pallets being formed of wood and being faced with metal having upwardly extending portions adapted to form the end faces of the brick, the pallets being provided with handling clips whereby they may be removed from the molding deck. C. M. S., Jr.

189. Cement tile-making machine. William Gillard. Canada. 1,424,469, Aug. 1, 1922. In a cement tile-making machine, the combination with a mold carrier and molds, means for guiding the mold carrier freely vertically, formers operating within the molds to force the carrier downward as the tile is built up, and counter weights opposing the downward pressure exerted on the mold frame, of normally vertical counterweighted lever bars mounted upon a swingable support, and means operated by the upward travel of the counter weights for drawing the counter weighted lever bars from the vertical to the horizontal position. C. M. S., Jr.

190. Plaster support for walls. Stephen J. Potter. U. S. 1,423,879, July 11, 1922. A paper wall board, comprising a strip of paper of laminated structure, having transverse strengthening ribs spaced apart thereon and attached thereto, each rib being formed transversely into an arch through the greater part of its length but flattened at the ends. C. M. S., Jr.

191. Appliance for throwing mortar for the plastering of walls. Theodor Moser.

Germany. 1,423,536, July 11, 1922. Mortar-throwing apparatus comprising a hopper, a casing into which the hopper discharges, a nozzle leading from the casing, a screw conveyor arranged for rotation in the casing and the flight of which decreases in pitch toward the discharge end of the conveyor, means to discharge compressed air through the conveyor and the nozzle, and driving means for the conveyor.

C. M. S., Jr.

BOOK REVIEW

The Potter's Craft. Chas. F. Binns. 2d. ed. D. Van Nostrand and Co., New York, 1922. The amateur student of ceramics will call blessings upon the head of Professor Binns for his enlarged second edition of "The Potter's Craft."

The Introduction and Chapter on Applied Art are an everlasting foreword for any craftsman or society of Handicraft, whatever the nature of the craft, and exemplifies their reason for existence.

The Chronological Review, of early Chinese to contemporary French and English, runs along racily. It touches upon various phases and outstanding ceramic figures with comment and salient distinctions so pointedly brought out that the lay reader acquires a comfortable sense of being conversant with the chief facts of Ceramic History.

Chapter four leads one to take his spade and discover local clays and gives practical directions for preparing, sieving, shaping and firing. Descriptions of specific clays and their characteristics are discussed and the uses for which they are suitable are defined. The subsequent painstaking details of mold-making, casting, throwing, etc. make one marvel that one who has the greatest scope as a technical educator should have the patience to work out, step by step, all the minutiae, so that the veriest amateur may know the joy of producing. What, but the greatest love for his craft and the greatest sympathy for the most feeble attempts in it, could animate such long suffering and patience!

Surely the amateur in no other craft is so shut out because of the wall of technical terms used by the trained ceramist. He has no language in which even to present his difficulties. In this work scientific expression is so qualified that the layman can, at least, follow the trend of professional method.

This is true especially of the chapters on glazes. The scientific compounding of a glaze batch is so explained that the serious student is inspired to embrace real knowledge in his efforts.

For school work, the book will prove a boon inestimable, as it gives the teacher of many crafts, a working idea of cause and effect, and furnishes formulae together with explanations of their type and application. So alluring is the chapter upon porcelain, that, having been led back to the source, the Chinese, you are keen to try for the impossible and to pursue "Liquid Dawn" or "The Red of the Bean-blossom."

Those who have sat at the feet of Prof. Binns and profited from his vivid presentations, will qualify his words "The personal note, tone and picture may be lost in reading from the printed page" with the reservation to the effect that we do regain an impression of his crisp recital and clean cut utterance which will keep his admonitions and appreciative encouragement always vivid in our minds. Mary Chase Stratton

CERAMIC ABSTRACTS

Compiled by the

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General and Miscellaneous

1. Coal saving methods in brickworks. ANON. *Brit. Clayworker*, **30**, 281(1922).—The power plant is usually one of the most inefficient sections of the works. Coal should be dumped into suitable bins near the fireholes, care being taken not to waste it. Coal loses heating power by being stored in the open. It may be moved most economically by means of continuous bucket or scraper and steel link conveyors. The best way to store coal is in bins separated by means of triangular sections of corrugated iron. Considerable coal is lost in the ashes due to poor stoking and firing with too thick a bed of coal. To det. if coal is present in the ashes, put the ashes in a pan of water and stir thoroughly. If coal is present it will float. A CO_2 recorder is a good investment since the percentage of CO_2 should be high to insure efficient combustion. The following table shows the reln. between the percentage CO_2 and fuel wasted:

CO_2	5	7	9	11	13	14	%
Fuel wasted	50	35	27	23	21	20	%

H. G. SCHURECHT

2. Data for fans. ANON. *Brick Pot. Trades J.*, **30**, 11(1922).—The following data was used for successfully installing induced draft and forced draft fans of the multivane type. Let D = outside diam. of impellor in ft.; W = width of impellor in ft.; D_1 = diam. of air inlet; Q = vol. of air in cu. ft. per min.; h = water-gauge pressure in inches; N = r. p. m.; V = peripheral vel. of impeller in ft. per min; Q and h being known, the first thing is to calculate the peripheral vel.

$$V = 3330\sqrt{h}$$

The diam. of the impeller is found next

$$D = \frac{\sqrt{Q \times 3.1416}}{V \times 1.3}$$

The r. p. m. will be found from the above equation

$$N = \frac{V}{3.1416 \times D}$$

The horsepower is given by the formula

$$\text{H. P.} = \frac{Q \times h}{3500}$$

The above formulae are for fans handling air at 50°F, with forced draft fans. In the case of induced draft where the fan has to handle gases at high temps. the decreased d. of the air must be taken into consideration, and the peripheral vel. will now be found to equal

$$V = 3330 \sqrt{h \times \frac{d}{d_1}}$$

where d = density of air at 50°F and d' = density at the temp. of the flue gases; D is as before and Q is the vol. of air at the temp. of the flue gases. The horsepower required will be as before. The propns. of the fan to which the above formula are applicable are:

Width of impellor $W = \frac{D}{2}$

Number of blades = 40 for impellers 9 in. to 15 in. diam.
48 for impellers 18 in. in diam. and upward.

Depth of blades radially $= \frac{D}{10}$

The inside width of casing $= \frac{2D}{3} + 1$ in., the space between the inlet and the impeller being made up by a taper connection leading to the inside circumference of the impeller. The diam. of the air inlet $= D + 1$ in. The width of the discharge opening $= \frac{3D}{4}$. These propns. of discharge openings are maintained no matter what resis. the fan works against, the limit of which for the multi-vane fans is generally 4 to 6 ins. water gauge. The blades are bent to a radius equal to their depth in the larger sizes (30 in. diam. fan and upward) and about $^3/_4$ their depth in the smaller sizes. The above formulae and propns. are not suited for fans operating at a high pressure, such as 12 in. water gauge. The discharge area of fan (A) in sq. ft. is $A = \frac{V}{v}$ where V = vol. of air at normal temps. and pressures in cu. ft. per sec. With most makers the discharge is square in form, and is considerably smaller than that of the fan eye, which is circular, although the former has often an adapter piece fitted to it which expands from square to round, the cir. diam. being equivalent to the fan eye. This taper piece or adapter prevents a sudden drop of air speed, which would have the effect of destroying the dynamic head, and so increasing the total pressure against which the fan would have to work. The adapter can be equally efficient if constructed throughout of rectangular form, and this is nearly always resorted to in the case of fairly large installations. In usual practice the fan inlet $= {}^3/_4 A$. H. G. SCHURECHT

3. Adhesives. P. SCHROT. *Raw Materials Rev.*, **1**, 180(1922).—An agglutinant for veneer is prepd. by mixing together lenzin (an impure gypsum), water, a small quantity of ocher, and leather glue which has been soaked in water for some 14 hrs. O. P. R. O.

4. Burning a down-draft kiln. ELLIS LOVEJOY. *The Clayworker*, **78**, 346–8 (1922).—L. discusses the different stages of burning, namely, water smoking, oxidation, heating up, driving the heat to the bottom, and fire flashing. J. W. HEPPLEWHITE

5. Cause and prevention of smoke in the boiler house. ANON. *Brick Pot. Trades J.*, **30**, 209(1922).—To burn 1 lb. of coal economically 18 lbs of air are required which equals 234 cu. ft. The furnace temp. will be 2750°F, the boiler efficiency 80% and 10 lbs. of water will be evapd. per lb. of coal. In general practice taking the average of 1000 boilers the average wt. of air per lb. of coal was 30 lbs. or 390 cu. ft., the furnace temp. 1700°F, the boiler efficiency 60% and the evapn. per lb. of coal 7½ lbs., 15 cwts. of coal in the first case gives the same evapn. as 20 cwts. in the second. The 25% coal not accounted for is lost as follows. One-fifth is present in the cinders and as small coal under the bars. The same amt. will escape as smoke. The balance is used in heating up uselessly 12 lb. excess air. Black smoke contains 2 grains of C per cu. ft. and if 390 cu. ft. of air is supplied per lb. of coal and this vol. heated to increased temps. it may be doubled and therefore during a black smoke period 1540 grains of coal are lost from every lb. used or over 25%. The rate of heat radiation with a furnace temp. of 2750°F is 3 times greater than when the temp. is 1700°F, therefore, with a clean boiler, 10 sq. ft. of the grate at 2750°F will do as much work as 30 sq. ft. of grate with a temp. of 1700°F. The correct ratio of the grate area to the outlet at the end of the furnace flue is important. This should be 2 to 1 but in practice it varies from 4 to 1 to 2.7 to 1. By giving all sizes of boilers the 2 to 1 ratio the thickness of the fires would be increased and this would automatically cut down the excess air, give increased furnace temp., make black smoke impossible and increase both the duty and the efficiency of both.

H. G. SCHURECHT

6. Use of hot air in continuous kilns. ANON. *Brick Pot. Trades J.*, **30**, 10–11 (1922).—The use of hot air from the cooling goods to watersmoke more brick is the most economical method of drying brick. The transference of ht. from the cooling chambers to those being smoked is effected by means of temporary pipes, the ends of which fit over the feed holes in each chamber. This flue is built along the top of the kiln and runs along its whole length. A short pipe may then be used to connect the flue with the cooling chamber and similar short pipe may connect the flue to the chamber to be smoked. When it is desired to introduce hot air into a chamber of freshly set goods, the caps on the feed holes of that chamber and also those on a chamber containing finished hot ware are removed and the damper between them opened. The increase in temp. is then measured with a thermometer. H. G. SCHURECHT

7. Corrosion in economizers. ANON. *Brick Pot. Trades J.*, **30**, 11(1922).—In the hand-fired boilers firemen rake out the cinders in the red hot state on the floor plate in front of the boilers where they are quenched with water. The vapors are condensed on the economizer tubes causing corrosion of the same. The remedy is to take the refuse direct from the fireholes into suitable receptacles and not rake them on the floor. H. G. SCHURECHT

8. Keeping water out of the clay pit. ANON. *Brick Pot. Trades J.*, **30**, 16(1922).—In open clay-pits the most satisfactory method of drainage is to dig ditches or trenches leading from various parts of the floor of the clay pit to the lowest level of the excavation and there to form a well or sump into which the water can drain and be kept clear of the working parts of the clay pit. Assuming an average rainfall of 28 in. each acre occupied by the clay hole will receive 2830 T. or over 100,000 cu. ft. of water per annum. This very large vol. of water must be removed by either a pump or a syphon (the latter is cheaper but seldom applicable) into a river or drain. As occasionally the rainfall reaches 200 T., or 7168 cu. ft. of water, the catch pit should be large enough to contain at least 10,000 cu. ft. of water for each acre of soil removed, if the catch pit is 20 ft. deep it must have an area of 500 sq. ft. or 25 ft. by 25 ft. H. G. SCHURECHT

9. The firing and the heat economy of the tunnel kiln. M. SPINDLER. *Ber. der Deut. Keram. Gesellshaft*, **3** [4], 171–87(1922).—Ideal burning curves and diagrams

showing the heat distribution and losses from tunnel kilns are given. A saving of $^1/_3$ to $^1/_2$ in fuel consumption is indicated for tunnel kilns compared with round or chamber kilns. When the ratio of air to gas, the gas consumption per hr., and the velocity of the ware are correctly regulated, a high yield of first quality ware will be obtained.

E. N. BUNTING

10. The importance of scientific research in the development of the ceramic industry in North America. K. ENDELL. *Ber. der Deut. Keram. Gesellshaft,* **3** [4], 199–214(1922).—Dr. Endell describes his trip through this country, giving a description of the ceram. schools and the ceram. industries here. He was very favorably impressed by the amt. of research undertaken in ceram., and warns his countrymen that Amer. is likely to surpass Ger. not only in quantity of ceram. products but also in quality. A short history of the AMER. CERAM. SOC., and the St. Louis (1922) meeting is given and the aid given to the industries by ceram. research, especially during the War, is reviewed.

E. N. BUNTING

11. English china clay. ANON. *Times Trade Supp.* (London), **11,** 19(1922).—A Boston member of the Tech. Assoc. of the Pulp and Paper Industry of America in a discussion of the relative merits of English and American clays claims that the English article is superior in colour, is more free from grit and in its greater plasticity possesses those qualities that are peculiarly essential in a coating clay. O. P. R. O.

12. Analyses of mine and car samples of coal collected in the fiscal years 1916 to 1919. ARNO C. FIELDNER AND OTHERS. U. S. Bureau of Mines, *Bulletin* **193.**—Giving the results of analyses of hundreds of coals from 25 States and Alaska. Information on heating values of the coals tested, is given as of interest to users of fuel. Methods for coal sampling and analysis are given, and a bibliography of the coal resources of the world. R. R. DANIELSON

13. The twelve-hour shift. CHARLES WADSWORTH, 3RD. *Chem. & Met. Eng.,* **27,** 1063–7(1922).—A discussion of the present status of this great problem, and a review of the report of the Federated Amer. Eng. Societies on The Twelve-Hour Shift in American Industry. Includes data on operation of glass, cement, lime, brick, and pottery plants. R. R. DANIELSON

14. Tables and charts for natural gas users. R. P. ANDERSON. *Chem. & Met. Eng.,* **27,** 1039–40(1922).—Author gives a number of tables and charts to be used in combustion study of natural gas, including computation of excess air, CO_2, heat losses, etc. R. R. DANIELSON

15. Testing smalt blue. ANON. *Oil and Colour Trades Jour.,* **62,** 1238(1922).—This blue potash glass is obtained by melting zaffer with potash and quartz. For the purest qualities pure cobalt protoxide must be used. The glass is poured into water in a melted state, whereby it becomes very brittle and can easily be powdered; scattering blue is the coarsest, and eschel the finest quality. The presence of foreign metals can largely reduce the value of the smalt; nickel turns it violet when heated, brownish when cold; iron causes a greenish shade; lead and bismuth produce a yellow, manganese a violet, copper oxide a greenish, copper suboxide a reddish coloring. Smalt is often mixed with gypsum and clay. O. P. R. O.

16. Ball and pebble milling for pulverizing and mixing. H. J. KLINEFELDT. *N. J. Ceramist,* **1** [3], 164(1921).—A paper read before the 7th. National Chem. Exposition in which the author discusses the uses of these mills. C. W. PARMELEE

17. Importance of grinding. HARRY G. WOLFE. *N. J. Ceramist,* **1** [3], 167 (1921).—Brief statement of the app. used in prepg. potters' materials. C. W. PARMELEE

18. The furnace gas producer. CHAS. W. PARKS. *The Ceramist,* **2** [1], 46–56 (1922).—A description of the furnace gas producer, and comparison of it with the producer gas installation. The furnace gas producer is a simple iron casting which is

fitted to each fire box, thus changing each into a producer. Steam is used in the operation. It may be used either with kilns or under boilers.

TABLE I.—COMPARISON COAL CONSUMPTION AND BURNING TIME

Hand Fired Kiln No. 35

Number brick	29,957
Burning time	6 days
Total coal consumption	56,270 pounds
Total ash per kiln	4,370 pounds
Coal consumption per 1000 brick	2,171 pounds

Furnace Gas Producer Kiln No. 5

Number of brick	28,153
Burning time	3 days, 14 hours
Total coal consumption	41,970 pounds
Total ash per kiln	3,210 pounds
Coal consumption per 1000 brick	1,491 pounds

Coal saving in Kiln No. 5 was 2 days and 10 hrs.

Data is given also showing the use of this gas producer under a boiler as contrasted with the results obtained with the regulation shaker grate. The author summarizes the advantages of the furnace gas producer as follows: "There is no smoke, and therefore no loss in unburned carbon and gases through the stack; no tunnels to build; no expensive burners; no expensive producers; the equipment cannot burn out; a high grade coal is not required, as any coal that will burn can be used; it can be installed as easily as grates; it brings about a better and cleaner product; and it eliminates carbon in ashes. Moreover, it is good for salt glazing, as by simply regulating the steam blast an intense heat can be obtained within the fire-box with clear oxidizing conditions, or a reducing flame can be obtained at a moment's notice, and these are the two factors of greatest importance in salt glazing." C. W. PARMELEE

19. The science of colloids. H. LOEWEN. *Chem.-Ztg.*, **46**, 449–50(1922).—Like Traube (*C. A.*, **16**, 2051), L. believes the term colloidal chemistry is a misnomer since the phenomena dealt with under this head are for the most part not strictly chem. in nature. He points out certain limitations in the theory of colloids but recognizes progress in the technical application of colloids even in the absence of a satisfactory theory.

H. B. W. (*C. A.*)

20. Artificial pebbles for tube milling. A. W. ALLEN. *Mining Sci. Press*, **124**, 405–9(1922).—Owing to the variation in the quality of the pebbles usually furnished, a series of tests are cited for the control of the flint pebbles or others to be used. (1) *Hardness.*—A test piece is cut out of the rock or pebble by a diamond drill and this piece is then revolved against a plate covered with sand for 1,000 revolutions at a uniform pressure. (2) *Toughness.*—This is measured by the blow required to fracture a specified sized piece. (3) *Abrasion.*—Abrasion is measured by the reduction caused by grinding of about 50 pieces of uniform size in a tube mill. Ordinarily the ore itself is not suitable for pebbles; the country rock, ordinarily much larger, is suitable and is used by selection of the correct sized pieces and chipping off the irregular edges, thus making pebbles of only roughly rounded form which will now not chip very much in the mill. A table giving the characteristics of rocks of different states is given and also illustration of various testing appliances are recommended. W. A. M. (*C. A.*)

21. Powdered coal as a fuel in the foundry. A. J. GRINDLE. *Trans. Am. Foundrymen's Assoc.*, **28**, 303–12(1921); *J. Inst. Metals*, **26**, 653–4(1921).—Powd. coal is consid-

ered practical in foundries using 10 tons of coal or its equiv. per day. The manner in which proper combustion can be obtained and the precautions regarding storage and conveyance to the furnace are discussed. V. O. H. (*C. A.*)

22. Artificial precious stones. Hj. Sjögren. *Årksbok Svenska Vet.-Akad.*, **1921**, 288–313; *Mineralog. Abstracts*, **1**, 382.—A review of the literature on artificial gemstones (corundum and spinel) dealing with the production on a com. scale, and the criteria for distinguishing them from natural stones. E. F. H. (*C. A.*)

23. Draft, resistance to draft, and progression of the fire in annular kilns. R. Seydel. *Tonind. Ztg.*, **46**, 64–5, 81–2(1922); *Chimie et industrie*, **8**, 613(1922).—A general discussion of the effects of variations in the resistance offered to the draft, and of the best manner of disposing the bricks to be baked in order to prevent such variations. A. P.-C. (*C. A.*)

24. Application of pulverized coal to boilers. J. W. Fuller. *Trans. Am. Inst. Mining Met. Eng.*, **66**, 701–10(1922); cf. *C. A.*, **16**, 813.—Discussion. J. L. W. (*C. A.*)

25. The use of low-grade fuels in the brick industry. O. Ricklefs. *Arch. Wärmewirtschaft*, **3**, 79–82(1922).—Peat and lignite are good fuels for ring ovens as they give long flames. More heating surface must be provided. Operating details of successful plants are given, and faults pointed out. E. W. T. (*C. A.*)

26. Investigation of the factors influencing the grain and bond in molding sands. C. W. H. Holmes. *J. Iron Steel Inst.*, Advance proof, 22 pp.(1922).—The mechanical and physical properties of sand for gray-Fe founding are as important as the chem. analysis. The bond adsorption value obtained on the raw sand may be greatly modified by mechanical treatment. The most successful molding sands contain both static and mobile bond. An appreciable degradation of the grains of a molding sand occurs during the mechanical prepn. as usually effected. The bond distribution factor is a characteristic of molding sands that is of great importance in view of the excessive degradation which may be caused by prolonging milling beyond the time needed to effect the optimum distribution. No single test is sufficient on which to judge the practical value of many molding sands, but a careful consideration of all those tests mentioned should be included. V. O. H. (*C. A.*)

27. Early chemical industry in America. A few comparisons of past and present conditions. C. A. Browne. *J. Ind. Eng. Chem.*, **14**, 1066–71(1922). E. J. C. (*C. A.*)

28. Weathering of Belgian bricks. Chr. K. Visser. *De Ingenieur*, **37**, 135–41 (1922).—Bricks, manufd. in Belgium and used for building in Holland, frequently become covered with a mold-like efflorescence, then crack and become soft and brittle. The efflorescence is almost entirely $MgSO_4$. The crystn. of this salt, involving an increase of vol., causes the disintegration of the brick. From new bricks up to 2.38% $MgSO_4$ can be extd. by H_2O. The clay from which the bricks are made contains much less $MgSO_4$ than the bricks; a part of the S is believed to be derived from the combustion gases of the furnace. If the bricks are heated to 900° $MgSO_4$ can no longer be extd. Heating to 900° or higher is, therefore, the best way of obtaining bricks which do not decay, even if $MgSO_4$ is present. Another remedy is the use of "fat" cement, contg. much $Ca(OH)_2$, which decomposes $MgSO_4$, forming insol. $Mg(OH)_2$, thus preventing efflorescence. R. B. (*C. A.*)

Apparatus and Instruments

29. Electric heating and controlling apparatus for small thermostat. S. O. Rawling. *J. Soc. Chem. Ind.*, **41**, 250–1T(1922).—This control operates by short circuiting a part of the resistance in series with an elec. heater when the temp. falls below the working level. Short circuiting is done by a relay system operated by a regulator consisting of a Hg make-and-break actuated by expansion and contraction of toluene. The

operating temp. is easily altered by a simple adjustment of the vol. of the working fluid, and position of the contacts. With room temp. at 15°, 27 l. of H_2O are kept at 25 ± 0.02°. D. E. S. (*C. A.*)

30. A new carbon dioxide recorder. ANON. *Electrician*, **89**, 15(1922).—This CO_2 recorder is elec. in operation, requires no chem. absorbent, has no delicate glass work and is claimed to be very active and sensitive. The meter contains 2 identical spirals of Pt wire enclosed in separate cells in a metal block. One cell contains air satd. with water vapor and the other is open to the flue gases. The Pt spirals form 2 arms of a Wheatstone bridge circuit. When the current flows, the spirals become heated, losing heat to the walls of the cell, their temps. and resistances depending on thermal conductivities of gases surrounding them. CO_2 changes in the gas cause changes in its cond. and a consequent change in the galvanometer deflection. The indicating or recording galvanometer may be calibrated to give direct readings on % CO_2. A portable CO_2 and temp. outfit is illus. and briefly described. It is enclosed with the recorder. Current is supplied by dry cells fitted into the lid of the case. When CO_2 readings are desired the flue gases are drawn past the CO_2 water by pressing a rubber bulb and the multiway switch is turned to the CO_2 position. For temp. readings a thermocouple is placed in the flue and connected by the 2 terminals, and the switch is turned to the position marked "couple." Each app. is illus. W. H. B. (*C. A.*)

31. A new thermo-regulator for the thermostat. PRIMO DORELLO. *Arch. farmsper.*, **33**, 184–5(1922).—The jacket of the thermostat is filled with mineral oil which has a coeff. of expansion about twice that of H_2O. The upper surface terminates in a tube of such diam. that the change in vol. of the oil caused by a rise or fall of 1° causes a difference in level of 1 cm. in the tube. A float in the tube is connected with a lever which makes and breaks the current passing through the heating coil. The oven is const. to 1° and may be set for temps. between 30° and 60°. A. W. D. (*C. A.*)

32. Refractometer for the determination of solid and liquid substances. C. LEISS. *Z. Krist.*, **56**, 524–6(1921).—Description with fig. of an instrument of the hemisphere type with several new appliances increasing its convenience and accuracy. P. B. (*C. A.*)

33. Electric precipitation of dust. A. VOSMAER. *Chem. Weekblad.*, **18**, 262–3 (1921).—A review of methods used in copper refineries, tunnels and cement works. NATHAN VAN PATTEN (*C. A.*)

34. Electrical flue-gas examiner. C. O. FRIEDRICH. *Chem.-Ztg.*, **46**, 848(1922).—An app. is described for the continuous examn. of flue gases. The flue gases pass over a wire which is elec. heated by a feeble current. The change in the resistance of this wire is measured by means of a Wheatstone bridge arrangement with which is connected a continuous recording device. Since the thermal cond. of CO_2 is only about 0.5 that of air or CO, the resistance of the wire is greater the higher the CO_2 content in the flue gases. H. JERMAIN CREIGHTON (*C. A.*)

35. Measurement of thermal conductivity of liquids, insulators, and metals. MAX JAKOB. *Z. Ver. deut. Ing.* **66**, 688–93.—J. describes the methods and procedure, which are very similar to those already used for water (*C. A.*, **15**, 977). For application in modern technical practice the temp. coeff. of the cond. is shown to be important. J. had found this positive for water, and equal to 0.003, while Lees had found it negative. For toluene at 20°, 0.000443 is found (much higher than results by most other experimenters). Lees' result for alc. is pronounced unsatisfactory. Some 30% Ni steels gave the very low value of around 0.029 at about room temp., 0.031 at 72° The importance of such metals is emphasized. W. P. W. (*C. A.*)

36. Report of committee on colorimetry for 1920-21. L. T. TROLAND. *J. Optical Soc. Am.*, **6**, 527–96(1922).—An attempt is made: (1) to clarify and standardize color

terminology; (2) to compile data fundamental to color science; (3) to specify standard stimuli and conditions for practical work; and (4) to encourage discussion and research along these lines. F. O. A. (*C. A.*)

37. Apparatus for measuring high temperatures. O. Friedrich. *Z. Sauerstoff-Ind.*, **13**, 117–20(1921); *Chimie et industrie*, **8**, 589(1922).—The *Holbern-Kurlbaum pyrometer* consists of a telescope focused on the body or the point of which the temp. is required. An incandescent elec. bulb is placed in the telescope in such a manner that the image of the filament is projected on the incandescent surface. By means of a suitable resistance, the intensity of the filament is adjusted so that its image loses itself in that of the hot body. At this point the temps. of the two are same. It is obtained from the deflection of a suitably calibrated galvanometer. The *ardometer* is intended to be attached to the wall of a furnace, for example. The radiations from the incandescent body are concd. by means of lenses on a small metal plate which heats up. It is placed at the junction of a thermoelec. couple. A. P.-C. (*C. A.*)

38. A simple instrument for testing refractive indices of liquids. R. Fouracre. *Pharm. J.*, **109**, 88–9, 105; *Chemist and Druggist*, **97**, 169–70(1922).—A small elec. bulb is used as the object and placed in the focus of a convex lens. The beam of parallel rays produced is sent downward through the combination of a convex lens resting on a glass plate, with the liquid to be examd. between the two. By moving the combination, along a vertical scale, the light is brought to a focus on a plane surface, showing the image of the filament. The distance between the upper surface of the glass plate and the image will be the focal length (d) of the combination of lenses. The focal length of the glass lens used being known, *e. g.*, 20 cm., then $n_{\text{liquid}} = 2 - 20/d$. The development of this formula is given. A table shows values of n for changes of d from 20 cm. to 61 cm. For a 20 cm. length, n varies from 1.000 to 1.672. The temp. of the liquid may be taken into account by putting the glass plate and lens into H_2O of the required temp. for a few min. before use. S. Waldbott (*C. A.*)

39. Modern radiation pyrometers. L. Neuray. *Rev. universelle mines*, 6 [6], 127–43(1920); *J. Inst. Metals*, **26**, 580.—The theory and design of radiation pyrometers are discussed, and descriptions are given of all the best-known makes. H. G. (*C. A.*)

40. A jointed microscope for laboratories and work shops. M. v. Schwarz. *Z. Metallkunde*, **12**, 366–7(1920).—A microscope with adjustable socket joints for the examn. of large specimens and of specimens in position is described and illustrated. R. S. W. (*C. A.*)

41. A new elutriator for rapid use. T. M. Lowry. *J. Oil Colour Chem. Assoc.*, **5**, 92–3(1922).—A serious objection to the use of the elutriator for controlling the efficiency of a grinding plant is that it is necessary to take out and weigh the coarse residue remaining after elutriation. This may be overcome by gradually tapering the lower end of the vertical tube into a graduated capillary of 2 mm. diam. After calibrating the tube for a given substance, residues can be read volumetrically. Illus. Discussion. F. A. Wertz (*C. A.*)

42. Kinetic flocculation meters. I. Wo. Ostwald and F.-V. v. Hahn. *Kolloid-Z.*, **30**, 62–70(1922).—A 2-legged flocculation meter has been developed from Wiegner's app. for soil analysis (*C. A.*, **14**, 84). It consists of two tubes 130 cm. long, joined in a U by a capillary at the bottom and fitted with a scale near their upper ends. It depends on the change in d. of the soln. during flocculation and sedimentation. The comparison liquid is placed in the narrower tube, which has a stop-cock at the top and the soln. in the wider one which has a stoppered outlet at the bottom. Both tubes are fitted with bulbs which minimize the errors due to mixing. The app. is filled and the stop-cock opened. The difference in level is read immediately and at intervals thereafter. The app. was used with Ag_2S and HgS solns. The difference in level is plotted

against the time in min. after addition of an electrolyte. When 25 millimoles of KCl per 1. were added to Ag_2S soln. made from 0.1 *N* $AgNO_3$, a coarse dispersion, which started to settle immediately, resulted. Sedimentation started only after 25 min. with a sol made from 0.00286 *N* $AgNO_3$ soln. Sols of intermediate concns. gave points between, and a curve connecting these points forms the *stability surface* characteristic of the soln. Increasing the concn. of KCl decreased the stability surface. HgS solns. were much more stable than Ag_2S. In the 1-legged flocculation meter the soln. is used to confine a gas under diminished pressure. As the flocculation proceeds, the change in height of the soln. is detd. at intervals. The 1-legged meter is more sensitive to temp. than the 2-legged one but the differences in level are greater and there is no mixing of liquids. The former was tried with *Ag_2S, HgS, mastic,* and *Au solns.* It gave a stability base-line when the change in level was plotted against the time. The time to the beginning of sedimentation with Ag_2S solns. was the same with both instruments. A blue Au soln. started to settle in 4 min., a red one in 16. Peptization probably could be measured with either app. WM. STERICKER (*C. A.*)

PATENTS

43. Viscosimeter. L. L. TIFFANY. U. S. 1,427,922, Sept. 5. The app. comprizes tubes of glass or other transparent material, in which oil or other substance to be tested is placed, and grooved plungers fitting snugly within the tubes serve as testing devices by the time required for their descent by gravity through the material. (*C. A.*)

44. Thermostats. GENERAL ELECTRIC CO. Brit. 181,645, Oct. 11, 1921. Bi-metallic-strip thermostatic elements, particularly those intended to be heated by an elec. current are formed of two materials both having relatively high elec. resistance but with thermal characteristics which are dissimilar even at high temps., such as 500°F. Preferably, the materials of both portions of the strip contain a substantial % of Ni, one being composed of a nickel steel alloy such as invar, and the other being composed of a Ni-Cu alloy or of nichrome. Suitable proportions for a Ni-Cu alloy are 82% of Cu and 18% of Ni. (*C. A.*)

45. Thermometer support for use in kilns. D. D. BUNDRICK. U. S. 1,430,937, Oct. 3. A frame is provided with a handle and cross bars for holding wet and dry bulb thermometers. (*C. A.*)

Chemistry, Physics and Geology

46. The dissociation of clay by lime. E. SELCH. *Sprechsaal,* **55,** 1, 2(1922).—In previous work (*Sprechsaal,* **173,** 1916), the effect of CaO upon ceram. bodies was studied. After the bodies had been fired the silicic acid and alumina sol. in HCl and NaOH were detd. At cone 04a it is necessary to have two mol. of CaO present to decompose one mol. of clay. After firing at cone 9 it is necessary to have only one mol. of CaO present to decompose one mol. of clay. In this work the above tests were continued more thoroughly. Different mixt. of lime and clay were fired to different temps. and the per cent material sol. in HCl and NaOH were detd. It was found that the higher the lime content the more thoroughly was the clay decomposed after firing. A mixt. of one mol. clay and 2 mol. of CaO is almost entirely sol. in HCl after firing to cone 1a. The CaO even when fired to a high temp. in a lime-clay mixt. is almost entirely sol. in HCl. In some cases the mixt. becomes more sol. when fired to the higher temps. whereas in others it becomes less sol. H. G. SCHURECHT

47. Formation of clays. ANON. *Brick Pot. Trades J.,* **30,** 14(1922).—The big difference in the properties of clays from various localities is attributed to their different methods of formation. Feldspars appear to be the origin of true kaolins whereas the clays derived from porphyry and basalt appear to be different from kaolins. The climatic conditions under which clays are formed are also important. In tropical

climates laterites are formed with a considerable amt. of iron, but in milder climates clays containing less iron are formed. The difference lies in the effect of humus on the formation of the clay, the propn. of humus being greatest in milder climates. The method of transportation whether by water, ice or wind also exerts an important influence on the properties of clays. Fire clays although free from most of the fusible impurities often have nodules of pyrites and marcasite which have been formed by the decomps. of vegetable matter in clay, and its action on the iron compds. present.

H. G. SCHURECHT

48. Bauxite clay. Ayrshire. G. V. WILSON. *Memoir Geol. Sur.* (Scotland), **1922.**—This Memoir contains an account of the geology of the Ayrshire bauxite clay deposit, its petrology, chemistry and probable mode of origin, and of its characters in the different areas where it is proved. O. P. R. O.

49. A new process for utilizing feldspar. ANON. *Can. Min. Jour.*, **43**, 790 (1922).—C. M. Brown, Toronto, has just perfected a new method of treating feldspar which makes all three of its constituent oxides commercially marketable commodities. The process is the application of acid gases to finely ground feldspar in a rotary kiln at low temperatures. The finished products are obtained by leaching and crystallization. Continuously recovering of chemicals and the avoidance of high temperature keeps the costs down to a point where operating profits are demonstrable. O. P. R. O.

50. Purification of clay. W. R. ORMANDY. *Chem. Trade Jour. & Chem. Eng.*, **69**, 750(1921).—History of osmosis method is given. In treating a very pure specimen of a well-washed English china clay by the osmose process, it has been found possible to deposit as much as 6,833 kilograms of dry-clay substance with 11.8 kilowatt-hours of current, when working at 50 volts pressure. The electro-osmotic process does not bring about any purification of the clay material in the actual osmose machine, but whatever may be the position theoretically, the fact remains that in practice such a purification is brought about, as has been proved beyond all doubt at the laboratory of the Osmosis Co., Ltd., by Mr. Lawrie, when working on tons of china clays and ball clays. (Contribution to the General Discussion on the Physics and Chemistry of Colloids and their Bearings on Industrial Questions, held by the Faraday Society and the Physical Society of London, on Oct. 25, 1920.) O. P. R. O.

51. Rocks rich in barium. (New South Wales.) ANON. *Memoir*, No. **8**, *Geol. Sur. of New South Wales.*, p. 337(1922).—A remarkable rock type has been found in the vicinity of Broken Hill, N. S. W., which appears to be unique in petrology. In hand specimen it is finely grained, of a greyish white colour, and looks not unlike an aplite. On closer view it appears to consist mostly of feldspar, with a few thin parallel streaks of a darker mineral. Its sp. gr. is notably higher than one would expect in such a rock. Analysis shows it to contain more than 9% of barium oxide, which is quite unique among silicate rocks. It seems most reasonable to suppose that the barium is contained in the feldspar, but a calculation shows that there is not enough alumina present in the rock to satisfy the feldspar formula, assuming all the barium and lime to be present in this mineral. The matter must remain unexplained for the present.

O. P. R. O.

52. Mineral colours. (India.) J. COGGIN BROWN. *Bull. Indian Industries*, No. **22**(1922).—The mineral colours may be divided into 3 groups as follows: (1) Natural mineral pigments. (2) Pigments made directly from ores or ore residues. (3) Chemically manuf. pigments. Group (1) includes the ochers, oxides, umbers, siennas, ground slate and shale. Group (2) includes sublimed white lead and sublimed blue lead (both of which are basic sulphates made directly from galena), zinc oxide and the red oxides made by burning spent pyrites. Group (3) includes a very large number of colours, such as white lead, chrome yellow, Prussian blue, etc. O. P. R. O.

53. China clay in Quebec. ANON. *Can. Chem. & Met.*, **6**, 243(1922).—The Canadian China Clay Co. is now operating deposits at Huberdeau, Quebec. The kaolin zone is about 1,000 feet wide and 7,000 feet long, but has not been fully prospected. The china clay occurs in veins and pockets in quartzite rock and although much of it is stained with iron it makes a very good fire clay. Regular mining methods are used. A shaft of 100 feet has been sunk and a lens of some 200 feet by 60 feet developed. O. P. R. O.

54. Mineral Pigments. (Queensland.) ANON. *Imperial Inst. Bull.*, **20**, 244 (1922).—In the Triassic rocks of Queensland, valuable deposits of oxides and ochers have been found. These are in the neighborhood of Cape Flattery, where there is scope for industry in earth colors. Samples of quartz sand washed from these pigment deposits in the course of refining have been investigated at the Imperial Institute, and found to be suitable for the manufacture of glass, for such purposes as the production of pale-tinted bottles. O. P. R. O.

55. Aluminium. (Russia.) ANON. *Mining Jour.*, **135**, 883(1921).—The alunite shales; the clays known as suchar and containing 40% alumina; and the nepheline rocks rich in aluminium, are not of value under present conditions. Of greater importance are the deposits of pure bauxite and similar rocks. The area of these deposits at present defined, is about 88 sq. mi., and the bauxite is irregularly distributed over this area, mostly in the form of pockets. Though bauxite deposits were discovered as long ago as 1882, only a little superficial work has been done on these Russian deposits. O. P. R. O.

56. Chemistry of alunite. H. BOWLEY. *J. Proc. Roy. Soc. W. Australia*, **7**, 48–83(1920–1).—Alunite from Kanowna (W. Australia) is white, finely cryst., very porous (28–58% air space), with sp. gr. = 2.65, n = 1.58. The transparent grains are pseudocubical rhombohedra. Eight analyses of alunite and Na-alunite are given. Up to 300° alunite is unaffected by dry heat. At 400° $4^1/_2$ mols. of H_2O are lost, by 500° the remaining $1^1/_2$ mols. are removed. On heating to 800° alunite is completely dissociated into K_2SO_4, Al_2O_3, SO_3, and H_2O. By 960° the K_2SO_4 dissociates and reacts with Al_2O_3 to form sol. K aluminate. Alunite is readily sol. in warm dil. solns. of HF, NaOH, KOH, Na_2CO_3 and hot strong H_2SO_4; slowly sol. in warm Na_2CO_3 solns.; moderately sol. in HCl and warm dil. H_2SO_4; sparingly in H_2O. It is attacked fairly readily by a $Ca(OH)_2$ soln. and appreciably by $CaCO_3$ solns. E. F. H. (*C. A.*)

57. The variation of the specific heat during melting and the heat of fusion of some metals. ITIRÔ ITAKA. *Science Repts. Tôhoku Imp. Univ.*, **8**, 99–114(1919); *J. Inst. Metals*, **26**, 505.—The sp. heats of Na, Bi, Pb, Sn and Zn have been detd. in the liquid and solid states at various temps. There is a discontinuous change on melting, being an increase for Na, Bi, and Zn, but a decrease for Pb and Sn. The sp. heat in the liquid state is independent of temp. The latent heats of fusion of the same elements have been detd. H. G. (*C. A.*)

58. The chemical constitution of feldspars. Analysis of two microclines. M. E. DENAEYER. *Bull. soc. chim. Belg.*, **31**, 131–47(1922).—Theories of the constitution of complex silicates (W. and D. Asch, "Die Silicate," Berlin, 1911; P. Erculisse, "Classification chimique des silicates naturels," Brussels, 1920; J. Jakob, *C. A.*, **15**, 36) are discussed, and an attempt is made to apply Werner's coördination theory to the problem. Some formulas based on the latter theory are given and a pseudo-phase rule diagram based on these is used to suggest the mutual relationship of quartz, orthose, plagioclases, micas, and spinels. The connection between the views put forward by Jakob and by F. W. Clarke is briefly discussed. The analysis of two microclines (triclinic potash-soda feldspars) is considered to indicate that they are built up of 3 sep. components in solid soln., and a study of results of analyses carried out by other workers tends to confirm this view. J. C. S. (*C. A.*)

59. Studies at high temperatures. XV. The vapor pressures of the alkali fluorides. Otto Ruff, Gerhard Schmidt and Susanne Mugdan. *Z. anorg. allgem. Chem.*, **123**, 83–8(1922); cf. *Ceram. Abs.*, **1** [3] 60.—Vapor pressure-temp. curves for the fluorides of Cs, Rb, K, Li and Na are given between pressures of about 50 mm. Hg and 1 atm. For exptl. methods of. The curves are roughly parallel, and the order of metals given above is the order of decreasing vapor pressure at any temp. For any given pressure Rb has a curve about 160° above Cs, K about 80° above Rb, Li about 180° above K, and Na about 30° higher yet. The centigrade boiling points are:

LiF	NaF	KF	RbF	CsF
1670	1705	1498	1408	1253

Heats of vaporization, the Ramsay-Young consts., and *critical temps.* (from the Guldberg-Guy rule) are calcd. A. E. S. (*C. A.*)

60. A simple method for the estimation of the soda content of a potash. L. Springer. *Sprechsaal*, **54**, 328(1921); *J. Soc. Glass Tech.*, **5**, 143–4.—If the alky. of a sample of potash is due entirely to Na_2CO_3 and K_2CO_3, the content of each can be detd. by a single titration with acid. With 3.45 g. of sample, each cc. of 0.1 *N* acid over the vol. required to neutralize this wt. of pure K_2CO_3(50.0 cc.) indicates 6.63% of Na_2CO_3. W. T. H. (*C. A.*)

61. Crude aluminium ores in Hungary. B. Horváth. *Termeszettud. Közlöny* (Budapest), **47**, 795–804(1915); *Mineralog. Abstracts*, **1**, 385.—Hungarian bauxite deposits are located in the Bihar Mts. Eight analyses are given. Bauxite ores of other countries are briefly discussed. E. F. H. (*C. A.*)

62. Data on colloidal clays. J. Splíchal. *Zemědělsky Archiv. Prague*, **10**, 413–31 (1919); *Mineralog. Abstracts*, **1**, 288.—The only reliable test for amount of colloidal clays in the products of weathering is that given by the hygroscopicity and not that given by the adsorption of coloring matters or salt solns. The *n*s. for various colloidal clays before and after ignition are given; also for a series of artificial gels after ignition. The *n* decreases with increasing silica. E. F. H. (*C. A.*)

63. Chemical relations of kaolinite at high temperatures. Jos. Matějka. *Chem. Listy*, **13**, 164–6, 182–5(1919); *Mineralog. Abstracts*, **1**, 287.—The soly. of kaolinite in boiling *N* NaOH at 110–1100° is given. The water goes off at 500–600°, and above 1100° there exists only a mixture of fibrolite and cristobalite, whereas at the lower temps. several Al silicates exist. E. F. H. (*C. A.*)

64. The chemical constitution of silicates. B. Gossner. *Centr. Mineral. Geol.*, **1921**, 513–25.—A theoretical paper in which G. criticizes current views as to the chem. constitution of silicates. Attempts to deduce from the chem. compn. of a crystal the constitution of the corresponding mol. unit are fallacious. It is pointed out that the existence of complex silicates such as $(SiO_4)_3Al_2Ca_3$ or Si_3O_8AlK at the high temps. at which the corresponding minerals were formed is most improbable, for the chem. affinities of silica and alumina, slight at ordinary temps., diminish at higher temps. For similar reasons, the existence in minerals of such radicals as $—Al(OH)_2$ is inconceivable. G. endeavors to show that, by postulating the existence of a limited no. of simple stable silicates as mol. individuals, the structure of more complicated silicates can be explained as due to combinations of these. Without inquiring further into the nature of the combination of the simpler silicates to the more complex forms, this may be taken as similar to that existing in cryst. double salt or in solid compds. contg. water of crystn. The simple silicates postulated are SiO_3Na_2, SiO_3Ca, SiO_3Mg, SiO_2, Al_2O_3, all of which can readily be obtained cryst. from the fused state. When water is a constituent of a silicate crystal, hydroxides such as $Ca(OH)_2$ or $Mg(OH)_2$ may be present, and, in certain circumstances, AlO_2H and AlO_3H_3, both of which are known in the cryst. state. From this point of view the compn. of several groups of minerals is discussed, particularly in

relation to the paragenesis of the minerals. As an example, in the alkali-lime-silicate group, the following formulas are given: nepheline, SiO_3Na_2, $[SiO_2,Al_2O_3]$; leucite, SiO_3K_2, $[SiO_2,Al_2O_3]$, $2SiO_2$; albite, SiO_3Na_2, $[SiO_2,Al_2O_3]$, $4SiO_2$; anorthite, SiO_3Ca, $[SiO_2,Al_2O_3]$. These formulas bring out well the relationships between the minerals of this group, the fact that nepheline and anorthite have sharp m. ps. while the others have not, and that the former pair more readily undergo secondary changes in geological deposits, for instance into zeolites, while the others behave as if they were in a sense more satd. Numerous other groups are also discussed. J. C. S. (*C. A.*)

65. Aluminium hydroxide and "aluminic acid." Robert Fricke. *Z. Elektrochem.*, **28**, 357–8(1922).—Polemical against F. Goudriaan (cf. *C. A.*, **15**, 478; **16**, 2088). H. J. C. (*C. A.*)

66. Report from the chemical laboratory of the Royal Hungarian Geological Survey. B. Horváth. *Magyar Kir. Földtani Intézet Jelentése* (Budapest), **1915**, 471–86; **1916**, 511–30; *Mineralog. Abstracts*, **1**, 385.—Numerous analyses of rocks, clays, soils, phosphatic earths from caves, ores, coal, and waters are given. Analyses of 4 bauxites from Com. Bihar gave: Al_2O_3 56.77–64.61, Fe_2O_3 2.84–25.82, SiO_2 1.39–11.56, TiO_2 1.05–3.86, CaO trace–3.07, MgO up to 3.05, H_2O 0.09–0.45, H_2O + 11.19–14.20%. E. F. H. (*C. A.*)

67. System Fe_2O_3–SO_3–H_2O. E. Posnjak and H. E. Merwin. *J. Am. Chem. Soc.*, **44**, 1965–94(1922).—This system was investigated over the temp. range 50° to 200° and the following cryst. phases were encountered: Fe_2O_3; $Fe_2O_3.H_2O$; $3Fe_2O_3.4SO_3.9H_2O$; $Fe_2O_3.2SO_3.H_2O$; $Fe_2O_3.2SO_3.5H_2O$; $2Fe_2O_3.5SO_3.17H_2O$; $Fe_2O_3.SO_3$ (2 forms); $Fe_2O_3.3SO_3.6H_2O$; $Fe_2O_3.3SO_3.7H_2O$; $Fe_2O_3.4SO_3.3H_2O$ and $Fe_2O_3.4SO_3.9H_2O$. The conditions under which these substances are formed, the ranges of their stabilities, and their relations to one another, also some of their crystallographic and optical properties, were determined. The data obtained are presented by means of tables and graphically by means of curves and a solid model. J. M. B. (*C. A.*)

68. Diffusion of hydrogen and helium through silica glass and other glasses. G. A. Williams and J. B. Ferguson. *J. Am. Chem. Soc.*, **44**, 2160–7(1922).—Both H and He diffuse through silica glass. The permeability is proportional to the pressure and is an exponential function of the temp. The permeability to H becomes appreciable above 300° and to He is easily measured at 180°. At 500° the permeability to He is about 22 times that to H. Both Pyrex glass and Jena combustion glass are impermeable to H; the former, however, becomes black. The Jena glass is permeable to He. J. M. B. (*C. A.*)

69. Specific heat gases. G. A. Brender à Brandis. *Het. Gas*, **41**, 255–9(1921).—Four tables are given: (1) true sp. heat at const. pressure per kg., (2) av. sp. heat at const. pressure per kg., (3) true sp. heat at const. pressure per cu. m., (4) av. sp. heat at const. pressure per cu. m. These data cover the range of temps. from 0° to 3000°, and are for SO_2, O, N, CO, H, air, and water vapor. N. V. P. (*C. A.*)

70. The white clay industry in the vicinity of Langley, So. Carolina. W. M. Weigel. Bur. Mines, *Repts. Investigations*, No. **2382**, 6 pp.(1922).—Details of mining methods and prepn. for market are given. The kaolin occurs as lenses with 5 to 75 ft. overburden. Three analyses show: SiO_2 44.00–44.66, Al_2O_3 37.90–40.25, Fe_2O_3 1.43–2.53, TiO_2 1.25–1.50, CaO 0.08–0.28, MgO trace, alk. 0.40–0.77, ign. loss 12.14–13.17. Rational annal. of 2 samples showed: clay substance 99.29, 99.60; quartz 0.49, 0.16; feldspar 0.47, 0.64. The clay is used chiefly for paper making, also for pottery and china without washing. C. H. K. (*C. A.*)

71. The color of iron oxides. J. A. Hedvall. *Z. anorg. allgem. Chem.*, **121**, 217–24(1922).—Fe_2O_3 may assume different tints depending on the temp. of formation and the duration of heating. These may all be divided into 2 groups, the bright orange,

red, and the darker colors. The first is prepd. by heating $Fe_2(SO_4)_3$ at a temp. below 650°. The differences in color may be due to different modifications or to different crystal structures. Microscopical examn. of 27 samples of Fe_2O_3 showed that all were composed of grains except that prepd. from $Fe_2(SO_4)_3$, which was in the shape of plates or scales. The difference in color is due to the difference in the reflection of light from the different shapes of crystals. F. E. B. (*C. A.*)

72. Preliminary report on the bauxite occurrences of northern Bihar (Királyerdö). P. Rozlozsnik. *Magyar Kir. Földtani Intézet Jelentése* (Budapest), **1916**, 450–4; *Mineralog. Abstracts*, **1**, 385.—These are ferruginous bauxites, red or light-brown, with Al_2O_3 over 53%. They occur as beds or lumps between limestones. Near diorite they are metamorphosed, are darker, and contain pyrite and diaspore. E. F. H. (*C. A.*)

Refractories and Furnaces

73. Fire clay refractories. Alan G. Wikoff. *Chem. & Met. Eng.*, **27**, 969–71 (1922).—An outline of manufacturing operations at the Laclede-Christy Clay Products Co., St. Louis, in the production of dry-press and stiff-mud process fire brick, special shapes, glass house refractories, and washed pot clay. R. R. Danielson

74. Manufacture of fire clay refractories. Alan G. Wikoff. *Chem. & Met.*, **27**, 505(1922).—An outline of plant operations at the Even & Howards Fire Brick Co., St. Louis. Gives a description of plant layout, of raw materials used and their preparation, and of forming, drying and burning of brick. Mfg. operations are coördinated by the planning dept. to obtain max. production efficiency. R. R. D.

75. Thermal conductivity of refractories. W. A. Hull. *Chem. & Met.*, **27**, 538(1922).—A review of the literature on thermal conductivity of refractories. Hull cites work done by Wologdine, Dudley and by Dougell, Hodsman and Cobb The latter give formula for computing coeff. of thermal conductivity (K_t) for temp. to 1000°C.

Fire clay brick, $K_t = 0.00155 + 0.25 \times 10^{-5}\, t$.

Magnesia brick, $K_t = 0.0285 - 0.379 \times 10^{-4}\, t + 0.179 \times 10^{-7}\, t^2$.

H. considers the work of latter two investigators as satisfactory for ordinary engineering purposes, but calls attention to the need for a std. method of making routine conductivity tests of commercial materials. R. R. D.

76. Refractories, with special reference of recent developments. W. F. Rochow. *N. J. Ceramist*, **1** [3], 181(1921).—General discussion of the properties of silica brick, its physical characteristics and uses in the steel and glass industry, lime kiln linings and muffle furnaces. *Clay refractories and their testing.*—Soapstone has been supplanted with good results by the use of a good quality of machine-made fire brick in the sidewalls and bottoms of lead smelting furnaces. The general trend of the development in clay refractories has been toward the use of better grades. All-clay steel-melting crucibles are more widely used now than previously. This demand is regarded as temporary, as greater care is required in handling the all-clay product. Heretofore, the English Stourbridge and Stannington clays have been used almost exclusively. Good results can now be secured with combinations of Ohio and Pennsylvania clays; in most cases even better service has resulted from the use of all Amer. clays. *Carbon or graphite refractories.*—Combinations of domestic clays have given superior service when substituted for German clays. *Basic refractories.*—Sufficient experience has been had to make evident the fact that dolomite cannot be used economically in place of magnesite. *Patent metalkase magnesia brick.*—"Patent Metalkase Magnesia Brick" are made by filling soft steel containers with ground calcined magnesite. The use of these brick promises an increased life of from 15 to 25 times over that of silica, and about three times that of magnesia brick. *Bauxite brick.*—A bauxite brick of approx. 56% alumina has been manufd. commercially for several years, which finds its chief application

as a lining of rotary kilns used for burning Portland cement, also, along the clinker lines in boiler settings. C. W. PARMELEE

77. The expansion of silica brick in coke ovens. ANON. *Brick Pot. Trades J.*, **30,** 6(1922).—Silica brick used for coke ovens in England are made of a mixt. of clay and silica rock containing less than 84% SiO_2. Brick containing a higher SiO_2 content expand too much in firing. This expansion takes place much more rapidly at high temps. than it does at low temps. For this reason silica brick which may safely be fired at 1200°C spall badly when fired rapidly to 1400°C. Tridymite has the least expansion when heated but it has not yet been found practical to make brick wholly of tridymite. The best that can be done is to burn brick thoroughly at a temp. sufficiently high to reduce this expansion to a minimum which is about 1400°C. H. G. SCHURECHT

78. Mechanical handling. ANON. *Brick Pot. Trades J.*, **30,** 34(1922).—The use of mechanical conveyors in the place of barrows is yet in its infancy. A mechanical conveyor can place brick in a drier as well as a skilled youth can place them on a drier floor. If the conveyor is to be used, however, it will be necessary to use pallet driers in the place of hot floor driers. For unloading coal and carrying it to the boiler of kiln a mechanical conveyor is much more rapid than a man but where the stoker and burner have to wheel the coal as part of their daily work there is no direct gain in using a conveyor. Few firms have realized how much more clay can be loaded into wagons if a mechanical loader were used instead of the men at the clay face using shovels. There are several mechanical loaders on the market which will work their way into the bank of loose clay or shale and load it at the rate of 15 tons per hr. They consist of a modified bucket elevator with self-contained engine and a device for filling the buckets automatically. With such a device two men can throw down and load all the clay or shale required for an output of ten million brick without the men being unduly tired.
H. G. SCHURECHT

79. British Siemens furnace practice. FRED CLEMENTS. *J. Iron Steel Inst.*, **50,** 429–90(1922).—This paper does not discuss the subject from the refrac. standpoint, but makes numerous references to the refrac. problems involved. The opinion was expressed that the silica brick made today can hardly be improved to meet more severe temp. conditions. Inasmuch as they are pushed to the limit at present, any increase in temp. must be accompanied by changes in furnace design to keep the hotter flame from the brickwork. He believes that 15% of the heat can be saved by insulating the regenerators and flues. Checkers are discussed from the following angles: (1) Correct weight of effective brickwork, (2) Maximum heating surface possible per unit volumes, (3) Proper distribution of gases over checkers, (4) Best velocity through the checkers to give the most effective heat interchange. Expts. showed that with half-hour reversals the outer inch of a refrac. brick is the only effective portion and that a brick 2″ thick is the most economical. The percentage of ht. interchanged is very small in propn. to that which is stored in the checkers. A table of sp. hts., sp. gr., and conductivities is given. In discussing the paper practical men do not favor insulating refractories as the duty is more severe, but on the other hand favor water cooling. 95% of the doors in the U. S. are water-cooled, while the percentage in England is low. Dr. Rosenhain erroneously states that insulation does not impose more severe conditions if allowance is made in the fuel used. He does not recognize the fact that the temp. gradients are completely changed with insulation. R. M. HOWE

80. Properties of refractories under load at high temperatures. M. E. L. DUPUY. *Ceramique*, **25,** 308–310(1922).—The strength of refrac. at high temps. was measured by means of impact, by increasing the load from zero at a rate of 150 kgs. per min. and by means of a static load. The effect of firing temps. on a clay under load was also studied. It was found (see Fig. 1) that the clay had max. strength at 1000°C

when fired to 1350°C previous to testing and at 1150°C when fired to 1500°C before testing. This clay contained Al_2O_3 = 20.0, SiO_2(free) = 45.8, SiO_2(comb.) = 26.9, Fe_2O_3 = 2.1, K_2O = 0.51, Na_2O = 0.11, and ignit. loss = 6.95. The results of the tests with different loading methods are shown in Fig. 2. and indicate that the values obtained by impact and by increasing the load from zero are about the same and that these values are about $4^1/_2$ times as great as those obtained with a static load. H. G. SCHURECHT

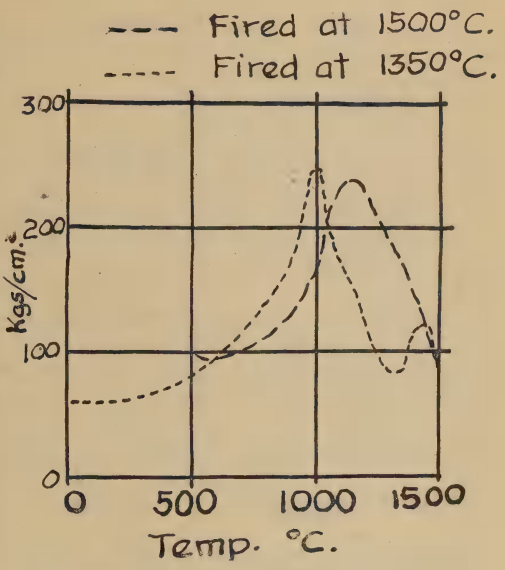


FIG. 1.

81. Carbon brick. A. P. *Deut. Töp. Ziegler Ztg.*, **53**, 219–20(1922). —The advantages of carbon brick for refrac. are: their resis. to high temps., to sudden temp. changes and their resis. to slag action. In their manuf. hard coke contg. not more than 8% ash is employed. This is crushed to 2 mm. size and mixed with 20% hot tar. The batch is thoroughly pugged and the brick are molded in wooden molds. After this they are dried about 2 or 3 weeks after which they are fired. In firing they are packed in powdered coke in a sagger or partition in a kiln and fired at cone 12. Slow cooling seems necessary as rapid cooling develops cracks. In laying carbon brick a mortar containing 20% clay and 80% coke dust is used. According to Seiger (*Stahl. u. Eisen*, **41**, 1912) carbon brick are best suited for lining blast fur. producing high carbon gray iron. It is claimed by some that they are very good for the production of Thomas iron while others state that the brick soon disappear in the production of white pig iron and Thomas iron due to their oxidation. It is evident that the value of these brick for metallurgical fur. has not been thoroughly investigated. H. G. SCHURECHT

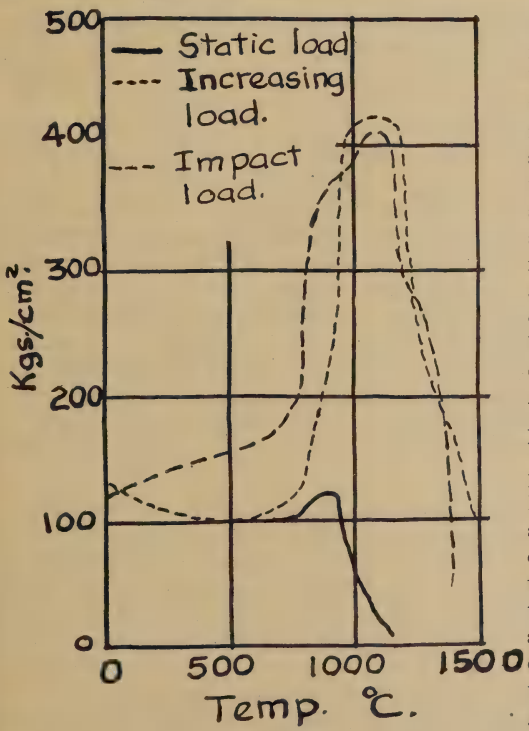


FIG. 2.

82. Electrical resistivity at high temperatures. M. L. Hartmann, A. B. Sullivan and D. E. Allen. *Brick Pot. Trades J.*, **30,** 16(1922).—The elec. resistivity of 9 commercial materials was detd. on $2^1/_2$-in. cubes which heated to 1500°C, the elec. resistivity being measured at intervals of 100°C. Fire-clay bricks of grade A quality and coarse texture, bauxite bricks and silica bricks with a lime bond gave regular resistivity curves. Carborundum bricks containing 95% of carbofrax C and 5% of bond gave similar curves, the resistivity being constant when the bricks were maintained at 1500°C. Carbofrax B on the contrary showed a rapid decrease in resistivity with increasing time of heating. Recrystallized carborundum ("Refrax") has quite regular curves, the resistivity being low at all temps. The resistivity curves of magnesia bricks for heating and cooling are quite different in shape, and this difference, with a peculiar flattening of the heating curves (indicating a constancy of resistance) between 1000° and 1500°C, appears to indicate that a phys. change of the structure occurs when magnesia is heated. The difference between the heating and cooling resistivity of brick made from natural zirconia is very marked. On heating the resistivity fell very rapidly until a temp. of 1200°C was reached, after which it fell very slowly indicating a permanent change on heating zirconia to 1200°C. Coarse grained chrome bricks possess low resistivities at all temps., the resistivity remaining practically constant from 1100–1200°C, increasing from 1200–1350°C and again decreasing from 1300–1500°C.

H. G. Schurecht

83. Bricks for malleable furnaces. H. G. Schurecht. *Foundry,* **50,** 707–10 (1922).—In malleable iron furnace bungs it has been found that bricks passing the usual load and softening point tests have often failed. Tentative conclusions from results, both lab. and factory, to date are: (1) burning to cone 8 gives greater resistance to spalling than burning to cone 10; (2) high load tests and fusion tests are not of first importance—good brick may or may not show high tests; (3) the spalling test seems the best guide—over 8% spalling loss (on quenching 10 times from 1350°) is dangerous; (4) bricks showing 15 to 28% porosity and 1.9 to 2.3 d. were best. SiC bricks were good but their heat cond. was too high. This could be corrected by proper insulation. C. H. K. (*C. A.*)

84. Refractories for coke-oven construction. W. J. Rees. *Fuel,* **1,** 20–2(1922); cf. *C. A.*, **16,** 2596.—The relative values of different materials for by-product coke ovens are shown by expts.: SiO_2, siliceous fire clay, semi-SiO_2 and fire-clay bricks were exposed to NaCl vapor (with and without H_2O vapor) at 800–1200°. The attack was much greater on the bricks contg. clay than on the SiO_2, the max. attack occurring with the fire clay, particularly at 900–1100°. The NaCl vapor penetrates the bricks, and the result of the slow interaction in the cooler portion and the rapid action in the hot part is to form a vesicular mass. This opens the bricks to further attack with disintegration. Expts. on a large scale, using salty coals, indicate that formation of $FeCl_3$ and NH_4Cl play an important rôle. Facing or glazing the exposed faces failed, owing to differential expansion. C. C. D. (*C. A.*)

85. Acid electric furnace practice. Chas. W. Francis. *Iron Age,* **110,** 345–6 (1922).—The present almost universal use of acid practice in the steel foundry results from war conditions, *viz.*, scarcity of magnesite and the demand for speed. Acid practice is the fastest when ordinary specifications only are to be met. The scrap charge should be 40 to 50% foundry scrap placed on the furnace bottom and the remainder of the charge light, quick-melting, basic scrap piled in the center of the furnace where it will melt more rapidly and will not cling to side walls. No slag mixture is added as the impurities in the scrap together with washings from the lining will form sufficient slag. An acid heat should be tapped when the slag bubbles and becomes puffy, *i. e.*, a "dry" slag. For small heats the lip-pour ladle should be used rather than

a bottom-pour. Alloy additions are best made in the furnace immediately before tapping. Methods of repairing bottom and burning in a new bottom are outlined.

L. J. (*C. A.*)

86. Electric furnaces. J. H. STANSBIE. *J. Birmingham Met. Soc.*, **7,** 259(1919); *J. Inst. Metals*, **24,** 488–9(1920).—S. reviews the principles underlying the generation of elec. current and the conversion of its energy into heat in elec. furnaces. The arc, resistance, and induction types of furnaces and combinations of these types are considered. Crucible furnaces in which the resistor either is external to the crucible, which is heated by radiation, or is the crucible itself, are also described.

V. O. H. (*C. A.*)

87. Basic electric furnace operation. CHAS. W. FRANCIS. *Iron Age*, **110,** 421–2 (1922); cf. Abs. **85.**—In basic practice CaO is charged with the scrap or added after partly melting down. With an oxidizing atm. and a basic slag P is removed from the metal. More than one oxidizing slag may be necessary with high-P scrap. After complete removal of the oxidizing slag, S is removed from the bath by a deoxidizing slag (CaO and C). On account of this ready removal of S, pig iron, malleable or gray iron castings are made on a basic bottom. Removal of P cannot, however, be readily accomplished in the presence of high C. Hence in the mfg. of irons low-P scrap must be used and iron practice in general becomes a melting and recarburization process. Some modern furnaces provide high and low voltage taps on the secondary thus permitting the use of a short arc on low voltage for refining after the charge has melted down. The short arc permits better control of temp. and is less destructive to roof refractories.

L. J. (*C. A.*)

88. Principles of high temperature furnace design. E. L. SMALLEY. *Trans. Am. Electrochem. Soc.*, **42,** preprint(1922).—The best elec. ovens, judged from the viewpoints of highest quality of products, lowest cost of operation and maintenance, and greatest safety in operation at high temps., must have these attributes: Muffled type where best suited to the process. Exposed element or radiant form only when best adapted to a process. Must have elements of sufficient number for cheap renewal. Elements must be readily and easily renewable. Coils must be fully supported, and yet free for expansion. Refractory parts must be thoroughly supported, but free for expansion. No internal connections of coils should be tolerated. Terminal sizes should be larger than the element size. Source of heat must be uniformly distributed. Size of furnace must be governed by the charge. Placement of elements should not control the furnace size. Thermal efficiency should be a controlling feature in decision. Transverse section of heating elements should be round. Exposed elements should preferably be in corrugated grooves. Elements should not be chosen to suit a voltage. Total weight of heating element should be high in proportion to the weight of the charge. Efficiency of heat insulation must be adapted to the work performed. C. G. F. (*C. A.*)

89. The new electric furnace of the Fiat works. G. VITALI. *Stahl u. Eisen*, **42,** 921–4(1922).—A description of this new furnace of the Heroult type. R. S. D. (*C. A.*)

90. The new electric steel furnaces of the Fiat works, Turin. G. VITALI. *Elektrotechn. Z.*, **43,** 1177–9(1922).—7 illus. A detailed description of the Fiat furnace. The 3 graphite electrodes are each 35 cm. in diam. The new electrode holders prevent unnecessary burning away of the electrodes near the roof of the furnace. In a recent test the monthly av. was 1,341,160 kg. of steel produced at a total consumption of 937,000 kw.-hrs. which includes energy required to keep the furnace warm over Sunday and holidays. C. G. F. (*C. A.*)

91. Technical thermoelectric processes. BRUNO WAESER. *Chem.-Ztg.*, **46,** 845–7 (1922).—Elec. furnaces, the materials used in their construction and their power requirements are discussed. The ash content, sp. gr., vol. of the pores, hardness and

resistance in ohms per 1 m. length by 1 mm.^{2} cross-section of 6 kinds of C electrodes are given. The processes for the manuf. of SiC and alundum are briefly surveyed. Other thermoelec. processes will be taken up in a later paper. H. J. C. (*C. A.*)

92. Refractory cements. W. S. QUIGLEY. *Trans. Am. Foundryman's Assoc.*, **28,** 479–80(1920); *J. Inst. Metals*, **26,** 655.—Q. divides bonding materials into four classes, *viz.*—(1) fire clay; (2) coarse grades of mixed materials (so-called cements); (3) cements depending upon a fibrous structure for holding component parts together; (4) cements capable of universal application. (1) and (2) have no binding strength of themselves unless subjected to a vitrifying temp., and then only a surface bond is obtained, owing to the inability of heat to penetrate the entire thickness of the wall. The result is a vitrified shell with a weak structural backing, which frequently bulges or collapses. The third type loses its binding properties as the temp. increases. The fourth type, to be of universal application, should air-set, and its binding properties should be independent of heat. It should be passed through a fine sieve so as to obviate the formation of voids between bricks. It should be capable of being used as a binder with crushed fire brick, old crucibles, fine sand, fire clay, ganister, for making rammed-in linings, and for doing repair work (unadmixed if necessary) hot or cold. It should have as nearly as possible the same coeff. of expansion as that of the materials with which it is used as a bond. A cement with a coeff. intermediate between those of fire-clay brick and silica brick (0.075 in. and 0.175 in., resp., per ft. at 1200°) could be advantageously used with either. H. G. (*C. A.*)

93. Induction furnace for melting non-ferrous metals. ANON. *Metal Ind.*, **20,** 312–3(1922).—A new type of induction furnace for non-ferrous metals consists of a melting chamber which resembles an ordinary crucible; located beneath this melting chamber and connected with it through two parts or ducts is another chamber in the form of a hollow cylinder encircling a primary winding and one leg of a laminated core. The molten metal in this cylinder constitutes the secondary of a transformer. A positive, unidirectional circulation of molten metal between melting chamber and heating chamber (secondary) is maintained by magnetic forces. The entire lining of the furnace consists of three parts, durable and easily replaced. The furnace in starting must be primed with molten metal to fill the secondary. Continuous operation is therefore best. Power consumption has been not more than 200 kw.-hrs. per ton of brass for continuous operation. The power factor on 60 cycles is about 0.75. Metal loss is less than 1% for 60–40 yellow brass. L. J. (*C. A.*)

PATENTS

94. Electric resistance furnace adapted for heat-treating metals. I. RENNERFELT. U. S. 1,428,908, Sept. 12. (*C. A.*)

95. Electric arc furnace adapted for melting zinc. I. RENNERFELT. U. S. 1,428,909, Sept. 12. (*C. A.*)

96. Electric furnace operation in metal refining. I. RENNERFELT. U. S. 1,428,910, Sept. 12. A charge such as steel to be refined is first heated by a free-burning arc supplied with 2-phase current and the charge is thereafter heated by arcs in contact with its surface supplied with 3-phase current. (*C. A.*)

97. Electric furnace for ore reduction. W. E. F. BRADLEY. U. S. 1,427,436, Aug. 29. A rotary drum furnace discharges into a tilting elec. furnace and receives gases from the elec. furnace. The latter is provided with a C tuyère placed so as to be covered by the molten charge in the furnace during charging and reduction and uncovered when the furnace is in pouring position. The furnace is especially adapted for reducing Fe ores. (*C. A.*)

98. Electric resistance furnace for melting brass or copper. E. H. HORSTKOTTE.

U. S. 1,427,814, Sept. 5. The furnace comprizes resistance heaters made up of dished disks in elec. contact at a peripheral zone only and surrounded by a refractory shield. (*C. A.*)

99. Linings for induction furnaces. M. UNGER. U. S. 1,429,909, Sept. 19. Closed conductors of different m. p. and which may be formed of rings of ferrous metal are placed within the heating space of a furnace and melted by an induced current to cure furnace linings of MgO and tar or other materials. (*C. A.*)

100. Reducing ores in electric blast furnaces. E. FORNANDER. U. S. 1,430,971, Oct. 3. An elec. furnace is used which has a vertical reducing shaft and a laterally extending melting chamber at the base of the shaft. Ore, *e. g.*, Fe oxide ore, together with limestone and other suitable additions, is charged into the top of the shaft and after the material descends into the melting chamber it is covered with C or other reducing materials. Part of the gases evolved in the shaft are forced into the melting chamber so as to pass through the reducing material. (*C. A.*)

Abrasives

101. Corundum in India. J. C. BROWN. *Bull. of Indian Industries & Labour*, No. **12**(1922).—Corundum is widely distributed throughout India; but as yet the statistics of production are quite incomplete. Corundum is the natural oxide of aluminium Al_2O_3. Its transparent varieties which form the ruby, sapphire, and other precious stones, are not here dealt with; only the opaque, dull and semi-translucent kinds of corundum which, on account of their great hardness, are used in the arts as abrasive materials are considered in this bulletin. O. P. R. O.

102. Abrasives. J. V. LEWIS. *Mineral Ind.*, **30**, 1–8(1921).—A statistical review of natural and artificial abrasives. A. B. (*C. A.*)

Stoneware, Whiteware and Porcelain

103. Blind glazes. ANON. *Brick Pot. Trades J.*, **30**, 15(1922).—Some firms making glazed ware are troubled with a defect called "blind glazes." This defect consists in the formation of a dull glaze instead of a glossy one, the dullness being irregularly distributed over the ware so as to prevent their being passed as matt glazes. It is invariably brought about by improper treatment of the kilns as the firing comes to a close. It is very liable to occur where the glaze contains a considerable propn. of ZnO or CaO together with a small amount of Al_2O_3, and the kiln is soaked at the highest temp. too long. To prevent this, add clay to the glaze and cool more rapidly at the high temps. Since crystals do not readily form in a very fluid glaze, "blinding" may be sometimes overcome by finishing the fire about one cone higher. When lead glazes are used undue soaking periods at the high temps. are certain to cause this blinding. Firing with a reducing kiln atmos. or with a wet fuel will also cause this defect.

H. G. SCHURECHT

104. The influence of composition upon the properties of porcelain. R. RIEKE. *Ber. der Deut. Keram. Gesellshaft*, **3** [4], 187–99(1922).—Nineteen porcelains made from Zettlitzer kaolin, 40–60%, Norwegian potash feldspar, 15–35%, and Hohenbockaer sand, 15–35%, where the per cent by wt. is varied in 5% steps for each constitutent, and burned to cones 13 to 17, were tested for burning shrinkage, tensile strength, impact resistance, compressive strength between steel balls, sp. gr., and dielec. strength. Most of the values found are given at the points on the triaxial diagram corresponding to the compn. of the porc. E. N. BUNTING

105. Notes on the shivering of terra cotta. JOHN L. CARRUTHERS. *The Clayworker*, **78**, 235–37(1922).—See *Jour. Amer. Ceram. Soc.*, **5**, 518–26(1922).

J. W. HEPPLEWHITE

106. How flower pots are manufactured. A. TAUBER. *Brick and Clay Record*, **61**, 398–401(1922).—(Translation from the German.) Discussion of requirements of finished product, selection of clays, old and modern methods of manuf.

J. W. HEPPLEWHITE

107. Factory preparation and burning of whiteware bodies. ARTHUR S. WATTS. *N. J. Ceramist*, **1** [2], 91–96(1921).—A discussion of the prepn. and burning of whiteware bodies covering briefly the following topics: raw materials; cleaning dirty ball clay; mixing the body: preparation of stain—the author recommends the following as the correct proportion: To 750 ozs. of pure water add 15 ozs. pure cobalt sulfate and stir until dissolved. Then add 7.5 ozs. carbonate of soda. The proper propns. of stain to body are: For a body contg. 10% ball clay, add 75 ozs. of stain soln. to each 1500 lbs. of body. For bodies with higher ball clay content increase the stain addn. in the same ratio up to 15% ball clay. For stain in glazes, add 10 ozs. of stain to each 100 lbs. of dry glaze. Glazes high in lead require more stain. *Sieves.*—Revolving sieves are less costly and do not clog so easily. *Filter press pressure.*—Max. pressure should be 80 lbs. for a body free from ball clay. Add 2 lbs. for every 1% of ball clay present. When the press stops running water increases the pressure 10 lbs. for a few min. *Aging and its effect.*—The temp. of clay cellars should be kept above 80°F and the relative humidity should be 90°. Aging is bad for elec. porcelain since it gives rise to gas blebs in the body. *Plasticity.*—Plastic clays are either "greasy" or "sticky." Eng. and Amer. clays differ in this respect. "Greasy" plasticity is preferable. *Pug mills.*—A slow rate of pugging produces an open body. A faster rate produces a granular, weak body. Too much speed causes the clay to heat. *Setting the kiln.*—The first and second rings should be set 1″ apart, except midway between the cuts, and the inside rings all set a like distance. Leave a 1″ opening between all rings. Not more than 6″ should be left between the top of the bungs and the crown at any point. In downdraft kilns, the center of the kiln may be set 12 to 15″ below the crown, and the burn improved if an opening is provided from top to bottom in center. *Kiln firing.*—For burning hard-fire porcelain, free from ball clay, with the body biscuited, the glost fire may progress as fast as the coal will burn, maintaining a condition bordering on reduction from the time the kiln is hot enough to develop such a condition, *i. e.*, from about the tenth hour. For best results, the fuel beds must never burn low enough to leak any air, as a highly oxidizing condition is as dangerous as a condition of extreme reduction. The temperature is dropped fast after finish to an orange red. Then close and cool slowly. By this plan it is possible to burn a 16′ kiln to cone 15 in 20 hrs. For *sanitary ware and electrical porcelain* the author gives the method of firing in considerable detail.

C. W. PARMELEE

108. The physical properties of porcelain. F. SINGER AND E. ROSENTHAL. *Ber. deut. Keram. Ges.*, **1**, 3(1920); *Sprechsaal*, **54**, 250(1921); *J. Soc. Glass Tech.*, **5**, 175–7.—Porcelain is not a homogeneous chem. or phys. substance. Each result refers only to the particular samples examd. The sp. gr. was 2.60 to 2.62, this being reduced in final burning to 2.3 to 2.5, according to the compn. The coeff. of cubic expansion varied between 0.0000045 and 0.0000065; the following were some linear expansion coeffs.: Berlin, 0.00000177 (—191 to 16°); 0.00000366 (16 to 250°); 0.000003645 (16 to 500°); 0.00000434 (16 to 1000°); Meissen, 0.00000269 (0 to 100°); Bayeux, 0.000002522 (0°), 0.000003265 (50°), 0.000004008 (100°), 0.000004305 (120°); Rosenthal lab. porcelain 352×10^{-8} and insulator H, 379×10^{-8} (20 to 100°); Seger porcelain 6833, 380×10^{-8} (20 to 100°); hard porcelain glaze 271×10^{-8}. Glaze fit depended, not only on correspondence of coeff. of expansion, but also on good elasticity, tenacity, pliability, and the resistance to stress and strain of the two components. For finished porcelain strong heating caused only a very small change of value in the thermal cond.

The mean value of the sp. heat of Berlin technical porcelain was 0.202 (20 to 200°) and 0.221 (20 to 400°). Porcelain retained heat 50 to 60 times better than iron. The heat of reaction during formation was exothermic. The modulus of elasticity for Hermsdorf porcelain gave a value of 6250 kg./mm.^{2} detd. from the values of breaking strain of rods. Observations of the bending of circular unglazed rods gave a modulus value for Berlin porcelain of 8280 kg./mm.^{2} Rods of Rosenthal porcelain gave values between 8400 and 17900 kg./mm.^{2} Values of the resistance to bending shock, as detd. by the oscillating hammer, ranged, in various types of Rosenthal porcelain, from 0.08 to 2.4 cm. kg./cm.^{2}, while resistance to compressive shock, as measured by the Martens's hammer, varied from 7 to 146 cm. kg./cm.^{2} Measurements of the hardness were obtained with any degree of regularity only by the Gary sand blast method, in which a comparison of the vols. lost under similar conditions was made. Cubic compressibility varied from 1.4×10^{-6} for highly siliceous samples to 1.8×10^{-6} for highly felspathic samples. The crushing strength showed as mean values for hard porcelain 4250 and 4780 kg./cm.^{2}; the tensile strength for Rosenthal insulating porcelain H was fixed at 261 kg./cm.^{2} Berlin porcelain was completely impervious to gas at 1300°, vessels composed of it had maintained a pressure difference of 30 mm. of Hg. at 100°, collapsing at higher temp. while still gas-tight. Berlin porcelain with a strong yellow color contained 0.82% of Fe_2O_3 and 0.31% of TiO_2. Small amts. of MgO, and, still more of ZnO, favored a white color. A thin sheet of porcelain was found to possess high double refraction. The sp. resistance of porcelain (after eliminating surface cond., due to grease, etc.) was high, but it fell rapidly with increase of temp. Increase of feldspar content decreased the resistance while increase of clay materials at the expense of SiO_2 added to the resistance at higher temps. The dielec. const. was 5.73, but highly felspathic, soft porcelain gave higher values. The velocity of sound in porcelain was fixed at 4900–5200 m./sec. Electrically poor porcelain had poor cond. of sound. The relationship between the cond. of sound and mech. properties was not known. H. G. (*C. A.*)

109. Electrical porcelain. A. Schwaiger. *Elektrotechn. Z.*, **43**, 875–80(1922).—Limiting voltages are discussed. C. G. F. (*C. A.*)

PATENT

110. Pottery; pigments. A. J. Stubbs. Brit. 181,132, March 12, 1921. Discolored earthy minerals such as kaolin, barytes, feldspar, bauxite, etc., are decolorized by suspending the finely divided minerals in H_2O to which are added pieces of Pt, Fe, or Zn. SO_2 is then introduced and is reduced by catalytic action to hyposulfurous acid, liberating O, which renders the coloring substances sol. in the hyposulfurous solvent. The coloring substances can be pptd. by CaO or an alkali for use as pigments. The SO_2 may be prepd. by the action of H_2SO_4 on metallic Cu. (*C. A.*)

Art and Design

111. Yellow etching compound. L. Springer. *Sprechsaal*, **54**, 212, 225(1921); *J. Soc. Glass Tech.*, **5**, 61–2.—This substance is obtained by mixing Ag compds. with yellow ocher and grinding intimately with water or oil. The intensity of color produced varies with the Ag content of the compd. (except in the case of the sulfide, which is stated to give a deeper color) with the temp. of burning in, and with the nature of the glass decorated. Opinions vary as to the effect of the glass on the depth of color produced. Zsigmondy, by the use of Ag phosphate, concludes that the color is caused by the reduction of Ag compds. which enter the glass, the action being due to impurities such as C, S, FeO, or metallic Pb. In this case, glasses free from impurities would not be affected. S. has made two similar alk.-lime glasses, one with potash, the other with soda, both decolorized with Ni oxide and Se. When these are treated with the

etching compd. under the same conditions, the potash glass is scarcely colored, while the soda glass becomes fairly bright yellow. Careful mixing and application of the mixt. are found to eliminate the dirty, uneven effect usually obtained in the treatment of certain weakly colored window glasses and of carbon-yellow glasses. A very hard, highly siliceous soda-lime glass is observed to be very little affected by the etching compd., even when heated until it softened. To est. the proportion of Ag which enters the glass, the residue of a Ag chloride-ocher mixt. (25 : 100) is treated, after burning, with NH_3, and the Ag chloride is then re-pptd. Only about 20% of the Ag is recovered.

H. G. (*C. A.*)

Heavy Clay Products

112. Handling the finished products of industry. GRAHAM L. MONTGOMERY. *Chem. & Met. Eng.*, **27**, 731–3(1922).—The handling of brick in manuf. by mechanical handling equipment is a simple problem, because of uniformity and size of product. Why modern methods have not been used. Suggests methods based on experience of American Enameled Brick and Tile Co., in use of conveying equipment. Number of brick handled in a given time has been increased 20%. R. R. DANIELSON

113. The making and marketing of common brick. J. B. ROSE. *N. J. Ceramist*, **1** [3], 198(1921).—Presented at a meeting of the N. Y. Building Congress. Existing conditions in the trade are attributed to ignorance, lack of sympathetic coöperation and half-season work. 40% of the labor employed in the Hudson River district comes from the south. It is suggested that a commission should be appointed to make a survey and full report regarding the requirements of the market for the year. The rules of the Board of Education in N. Y. City prescribe that no brick may be laid when the thermometer shows a temp. below 32°F. The author objects to this restriction. There is need for a law guaranteeing the producer and the supplier of materials compensation for such when furnished for building purposes. The author is of the opinion that there is sufficient clay along the Hudson Valley to meet all the future requirements of the Metropolitan district. The supply of sand for the purpose is limited.

C. W. PARMELEE

114. The properties of some ball clays. H. H. SORTWELL. *The Ceramist*, **2** [1], 5–15(1922).—Some of the results of an investigation of domestic and foreign ball clays conducted by the Bureau of Standards. *Miscellaneous properties of ball clays.*—(See Table I.) The oxidation test was conducted by the means of draw trials 2 x $1^1/_4$ x $1^1/_4$, and heated to 750° in 5 hrs., and held at that point. American clays contain less material coarser than 120-mesh than English clays. The average moduli of rupture were:

Kentucky clays	282 pounds per sq. in.
Tennessee clays	366 pounds per sq. in.
Devonshire clays	443 pounds per sq. in.
Dorset clays	405 pounds per sq. in.
English clays (source unknown)	419 pounds per sq. in.

The clays were divided into three classes according to their color—Class 1, the best; Class 3, the poorest. Graphs show the burning conduct of the clays. English clays vitrified at low temp. and remained almost constant in porosity and volume to cone 12, without signs of overfiring. Amer. clays showed gradual reduction in porosity from cone 01 to cone 12 and constantly changing volume. With one exception they did not vitrify before cone 12. Tenn. clays vitrified before Ky. clays. Comparisons of color were made on test pieces of a standard body mixt.

TABLE I.—MISCELLANEOUS PROPERTIES OF BALL CLAYS

Lab. No.	Name of Clay	Water of plasticity	Vol. drying shr.	Shr. water	Pore water	Ratio pore water–shr. water	Density dried clay	Residue on 120-mesh	Hrs. oxidation at 750°C	Mod. of rupture, 1 clay-1 flint
1	Knowles Eng. Ball Clay, No. 1	45.6	28.4	24.3	21.3	0.88	1.667	0.2	0.5	376
2	Knowles Eng. Ball Clay, No. 2	51.9	26.1	24.7	27.2	1.10	1.413	1.5	11.0	375
3	Knowles Eng. Ball Clay, No. 12	44.9	27.7	23.9	21.0	0.88	1.627	0.7	9.5	568
4	Whiteway Eng. Ball Clay	39.9	28.4	22.3	17.5	0.78	1.738	0.4	8.5	446
5	Eng. Ball Clay, No. 90	47.3	29.6	26.3	21.0	0.80	1.627	0.7	8.0	441
6	Pikes Ball Clay	46.3	32.2	27.9	18.4	0.66	1.742	0.2	4.5	381
7	Superior Ball Clay	46.4	28.2	24.6	21.8	0.89	1.598	1.2	11.0	563
8	Kentucky Ball Clay No. 4	46.7	28.1	24.7	21.8	0.88	1.593	0.1	3.5	372
9	Tenn. Ball Clay, No. 5	51.9	29.2	26.5	25.4	0.96	1.537	0.4	8.5	478
10	No. 25 Blue Ball Clay	48.3	33.5	29.5	18.8	0.64	1.712	0.9	2.5	403
11	Devon Ball Clay	44.3	26.5	21.9	21.4	0.98	1.652	0.4	2.0	345
12	Tenn. Ball Clay, No. 11	44.5	26.0	21.9	22.5	1.02	1.585	0.1	1.0	293
13	Dorset Ball Clay	45.9	33.0	28.1	17.8	0.64	1.753	0.1	1.0	492
14	Kentucky Ball Clay, No. 10	38.3	25.5	19.7	18.6	0.94	1.733	0.0	0.0	223
15	Eng. Ball Clay, No. 11	48.5	33.5	29.2	19.3	0.66	1.723	0.3	1.5	396
16	Fayles Ball Clay	47.0	32.7	28.3	18.7	0.66	1.714	0.8	2.0	347
17	Grindley Ball Clay	45.8	29.1	25.3	20.5	0.81	1.623	0.8	10.0	427
18	Great Beam Ball Clay	47.6	28.8	25.6	22.0	0.86	1.577	1.6	8.5	454
19	Kentucky Ball Clay, No. 9	41.5	27.0	22.1	19.4	0.88	1.671	0.0	0.0	253
20	Tenn. Ball Clay, No. 3	53.3	27.6	29.9	23.4	0.78	1.545	0.3	2.0	327
22	M. & M. Eng. Ball Clay	45.8	28.9	24.7	21.1	0.86	1.587	1.4	7.5	384

TABLE II.—COLORING EFFECT OF CLAYS IN STANDARD BODY

No.	Name of clay	Color of body	Class
1	Knowles Eng. Ball Clay No. 1	Very light buff	2
2	Knowles Eng. Ball Clay No. 2	White	1
3	Knowles Eng. Ball Clay No. 12	Light cream	1
4	Whiteway Eng. Ball Clay	Buff	3
5	English Ball Clay No. 90	Light buff	2
6	Pikes Ball Clay	Cream	2
7	Superior Ball Clay	Light buff	2
8	Kentucky Ball Clay No. 4	Cream	2
9	Tennessee Ball Clay No. 5	Light cream	1
10	No. 25 Blue Ball Clay	Light buff	3
11	Devon Ball Clay	Light buff	2
12	Tennessee Ball Clay No. 11	White	1
13	Dorset Ball Clay	Buff	3
14	Kentucky Ball Clay No. 10	Light buff	3
15	Eng. Ball Clay No. 11	Buff	3
16	Fayles Ball Clay	Buff	3
17	Grindley Ball Clay	Light buff	3
18	Great Beam Ball Clay	White	1
19	Kentucky Ball Clay No. 9	Light cream	1
20	Tennessee Ball Clay No. 3	Cream	2
22	M. & M. Eng. Ball Clay	Cream	2

(See Table II.) Class 1 includes those of the best color; Class 2, fair color; Class 3 poor color. American clays showed a good color. Tenn. clays were better color than Ky. The majority of Devonshire clays were in the second class; three of the four Dorset clays were in Class 3. American clays nearly equal the English in plasticity, they require more exact firing because of the variations in porosity and vol., with slight changes in ht. treatment, which is the reason for the difficulty observed in attempts to substitute Amer. for English clays. The more porous body obtained by substitution of Amer. clays is conducive to crazing. Successful substitution requires a little higher firing or readjustment of the flux content to produce the same degree of vitrification.

C. W. PARMELEE

115. Working wet lime clays. W. D. RICHARDSON. *The Clayworker*, **78**, 336–7 (1922).—Method of removing limestone pebbles in entirety described, then a résumé of results of various experiments is given as regards fineness of grinding, the temp. at which the ware is burned and the duration of the high fire to prevent mechanical destruction and pitting of burned ware. J. W. HEPPLEWHITE

116. The manufacture of silica-lime bricks. ANON. *Science et industrie* [March, 1922]; *Industrie chimique*, **9**, 360(1922).—Nearly all sands even those with 10–15% clay, are suitable. In the slaked lime process of manuf. the moistened mixt. is pressed and baked in autoclaves under a pressure of 8–10 kg. per sq. cm. A. P.-C. (*C. A.*)

Glass

117. Nuts in glass. ANON. *Glass Container*, **1** [12], 5–31(1922).—Descriptive article tracing the development of merchandising and extension of demand by packing nuts in glass containers. WM. M. CLARK

118. Bottle blowers "tip" builds park highway out of glass mountain. ANON. *Glass Container*, **1** [12], 11–26(1922).—For building a road in the Yellowstone National Park it was desirable to remove material from Obsidian Cliff, a mountain of natural glass. Powerful explosives were ineffectual in blasting away the mass. One of the engineers (a former glass blower) suggested heating the mountain and then spraying the mass with water to cause it to disintegrate. Log fires were maintained for $^3/_4$ mile along the base of the mountain for several days and then water was sprayed on and a tremendous explosion followed which loosened the entire face of the mountain and cleared the way for the road, also later the chunks of glass were found admirably adapted for road-building. WM. M. CLARK

119. The binary systems Na_2Sio_3–Na_2WO_4, K_2SiO_3–K_2WO_4 and Na_2WO_4–K_2WO_4. J. A. M. VAN LIEMPT. *Z. Anorg. Chem.*, **122**, 175(1922).—The binary system Na_2WO_4–Na_2SiO_4 has been investigated by Van Kloster (*Z. Anorg. Chem.* **69**, 154(1911)), who found that the fused salts were mutually soluble to a high degree. The present paper deals with viscosity and specific conductivity measurements of aqueous solns. of these salts to det. whether compds. were formed therein. No evidence of compd. formation was found in the series Na_2SiO_3–Na_2WO_4 or K_2SiO_3–K_2WO_4. E. W. TILLOTSON

120. Melting of glass. ANON. *Jour. Soc. Glass Tech.*, **6**, 3–17(1922).—General discussion at the Leeds Meeting, November 15, 1921. **Casing of opal on flint glass.**—The importance of exactitude and speed in covering the ball of flint with a uniform layer of the opal, and of having the two glasses match in expansion was pointed out (M. W. TRAVERS). With a softer covering glass, less accurate matching is required (W. E. S. TURNER). **Frequency of charging of batch into furnaces.**—It was agreed that *feeding of tank furnaces* at short intervals, 10 to 30 min., gave better quality of glass and meant a saving of fuel, provided the use of a dog house eliminated periodic cooling. With an open furnace and no bridge, large fillings seem to be better (J. ADAMSON). R. L. Frink prefers to add a charge of about one-fourth cullet and then to fill the batch

on top. In the case of *pot furnaces*, best results are obtained if the pot is filled with three successive equal charges (R. L. FRINK). **Influence of saltcake on decolorizing action of selenium.**—W. E. S. TURNER stated that while 1 to 2% produced no serious effect, laboratory experiments for 1 to 5 per cent showed that the decolorizing effect was certainly diminished. R. L. Frink has found that 1 to 2 per cent stabilized the color as well as being otherwise advantageous. The final color of the selenium glass depends also on the leering. **Dark spots in chromium green glass** are due to undissolved chromium oxide (J. H. DAVIDSON). They may be prevented by grinding the oxide fine or by mixing it with two parts of bichromate (F. G. CLARK). **Causes of secondary boil.**—This boil may be produced in a variety of ways, such as by a smoky gas flame depositing carbon on the surface (M. ASQUITH), by too great changes of temperature either cooling or heating after melting, by iron dropped in the glass, by the oxidation of carbon and sulphur coloring material, and by decomposition of small amounts of salt-cake (W. E. S. TURNER). **Action of various analytical reagents on chemical glassware.** W. E. S. TURNER AND T. E. WILSON. *Jour. Soc. Glass Tech.*, **6,** 17–20(1922).—In continuation of previous researches, four glasses were tested with nitric acid (sp. gr. 1.2), 2 N-ammonium sulphide solution and sodium phosphate solutions (N/2 and N/4). For the first two solns. the loss in 90 min. at 100 °C was only 3 to 5 mg. per 100 cm.², but the corrosion by the phosphate solution was somewhat greater, increasing with the concentration. This action seems not to be due merely to alkalinity, since one of the glasses is relatively much more corroded by the phosphate solutions and by 2 N-sodium carbonate solution than by N/10-caustic soda.

G. S. FULCHER

121. Polohalite. ANON. *Raw Materials Rev.*, **1,** 43(1922).—A mineral of great utility to the glass industry and for soap-making has been found in the valley of the Morelle River, Sicily. A dip has disclosed: Saline marle contg. gypsum, chloride of sodium 2 m., sulphates of various bases 14 m., sulphate and chloride of sodium 4 m., other sulphates of various bases, marle and gypsum in great masses. O. P. R. O.

122. Autoclave test for chemical glassware. GAILLIE AND WILSON. *Jour. Soc. Chem. Ind.* (London), **40,** 448R(1921).—Results from this test show a closer relationship between the degree of clouding and the amount of alkalinity. There was a considerable measure of concordance between the results obtained with the autoclave test and those obtained with the dimming test. There was a close relationship between the durability hardness and alumina content of these glasses. This investigation of the autoclave test was made primarily to test durability. O. P. R. O.

123. Glass discovery. ANON. *London Times Trade & Eng. Supp.*, **11,** 31(1922.)—The manuf. of glass and glassware is one of the oldest-established industries of Czecho-Slovakia. The new discovery is that of a silicate which is suitable for the production of raw glass without the aid of other ingredients. The mineral is of volcanic origin and as the deposits are very extensive they should provide the Czecho-Slovak glass industry with a cheap raw material. O. P. R. O.

124. Glass manufacture in Burma. ANON. *London Times Trade & Eng. Supp.*, **11,** 29(1922).—Burma possesses large quantities of raw materials for glassware. Despite the difficulties which face a pioneer industry of a highly technical kind, a native Burman has made such successful expts. that Burma has an established glass industry in the vicinity of Rangoon. O. P. R. O.

125. Glass powder. ANON. *Raw Materials Rev.*, **1,** 88(1922).—By rubbing the walls of a vessel with a glass rod, small particles of glass are rubbed off, which act as crystn. centers or coagulators. If the rubbing is continued for a time a deposit is obtained even in distilled water, meriting the attention of chemists. One can thus obtain glass

in suspension in the most various soln., the resistance of which by the addition of various substances can be increased, and small quantities of glass powder can be collected.
O. P. R. O.

126. Ruby glass. ANON. *Schnurpfeil's Rev. for Glass Works*, **6** [66], 1311(1922).—Copper ruby is one of the hardest colors to make and control. A simple batch is manganese with saltpeter or manganese in an opal base batch. In an opal batch use 2.5 MnO_2 for 100 of sand. The following batch colors out on reheating, sand 100, soda ash 40, borax 8, zinc oxide 10 to 12, selenium 1.25, cadmium sulphide 1.75. If zinc powder is used it will color in the furnace. Sulphur gives a fair ruby. Copper ruby is usually used in cased glass. The following batch colors out on annealing. Sand 100, soda ash 35, lead oxide 5, borax 3, lime 10, barytes 8, bone ash 0.5, red tartar 4, oxide of tin, 3, cuprous oxide 1.5. Phosphoric acid and barytes often aid coloring.
R. J. MONTGOMERY

127. Annealing and heat treatment of gauge glass. HENRY W. HESS. *Glass Worker*, **41** [53], 11(1922).—Gauge glass subject to sudden temp. changes should be uniformly strained and not well annealed. If local strain is introduced by cutting off or fusing the ends it may be made uniform by heating to about 1300°F and cooling rapidly and evenly in air. R. J. MONTGOMERY

128. To tarnish or etch glass surfaces. MARCEL AND ANDRÉ FICHTER. *Glass Worker*, **42** [5], 15(1922).—A French patent by M. and A. Fichter increases the working life of a hydrofluoric acid bath to 3 or 5 weeks and reduces the emission of vapor to almost nothing. Two baths are mixed separately and then put together in any propn. desired, as follows. Bath 1, + fluoride of sodium 5 gr., water 5 gr., sulphate of potash 1 gr.; bath 2, + chloride of zinc 2 gr., hydrochloric acid 3.5 gr., water 4.5 gr. Use the same as the old type of bath. R. J. MONTGOMERY

129. Natural constants and technical constants of glasses. E. ZSCHIMMER. *Z. Elektrochem*, **28**, 194–201(1922).—A lecture. Values of a no. of different consts. for various kinds of glass are compared and discussed. H. J. C. (*C. A.*)

130. The necessity for preheating air in furnace work. A. POPOFF. *Sprechsaal*, **54**, 496(1921).—A theoretical consideration of fuel saving by preheating the air used in a glass tank furnace. H. G. (*C. A.*)

131. Rubbing of glass walls with a glass rod. ROBERT FRICKE. *Z. Elektrochem.*, **28**, 244–5(1922).—Crystn. is promoted by rubbing the glass walls of a vessel with a glass rod, not by mech. shock as is often stated in text-books, but by the production of a fine glass powder the particles of which act as crystn. nuclei. H. J. C. (*C. A.*)

132. Comment on R. Fricke's communication "Rubbing the wall of a glass vessel with a glass rod." L. DEDE. *Z. Elektrochem.*, **28**, 364–5(1922); cf. preceding Abs.—It is claimed that the formation of crystals takes place more readily when the walls of a glass vessel are rubbed with a rubber-covered rod instead of a glass rod, and that the formation of crystals is probably due to electrostatic causes. Reply. R. FRICKE. *Ibid.*, 365–6. H. J. C. (*C. A.*)

133. Optical glass. Its properties and production. J. W. FRENCH. *Optician*, **59**, 335, 351; **60**, 3, 18, 28(1920); *J. Soc. Glass Tech.*, **5**, 112–3.—A brief account is given of the history of glass from the earliest times. The optical properties of glass are considered at length, the loss of light due to various causes playing a large part in the production of optical instruments. Important defects in optical glass are lack of isotropy and homogeneity, the former due to insufficient annealing and the latter to veins and striæ. The striæ are avoidable by finely grinding the batch constituents and thoroughly mixing them, and by keeping the fluid glass well stirred. Veins due to the solvent action of the glass on the pot and stirrer can best be minimized by suitably choosing the clays from which these are made. The devitrification of glass is fully

discussed. A curve shows the increase in durability of a soda-lime-silica series of glasses due to the increase of lime content. Glasses contg. less than 6% of lime are unstable on account of their defective durability, while if the percentage is greater than 17 (the silica content remaining at 70%) they are impracticable owing to melting difficulties and opalescence due to devitrification. A similar curve illustrates the decrease in durability of a series of flint glasses as the lead content increases. The building and drying of the pots are described and a short account is given of glass works furnaces. This is followed by a description of the actual melting process, special attention being directed to stirring. The molding into small pieces, inspection for defects, and annealing operations are briefly described. H. G. (*C. A.*)

134. Dispersion formulas and the secondary spectrum. T. SMITH. *Trans. Optical Soc.*, **22**, 99(1920–21); *J. Soc. Glass Tech.*, **5**, 181–2.—From a study of the n's of many glasses the data being derived from the Jena glass lists, S. empirically deduces a formula by means of which n for any wave length, λ, can be calcd. from the relative dispersions. For a "normal" glass this formula is $n - n_D = [0.226(n_F - n_C) + 0.0062(n_D - 1)](\lambda^{-0.91} - \lambda^{-0.91}_D)/(\lambda^{-0.91}_F - \lambda^{-0.91}_C) + [0.774(n_F - n_C) - 0.0062(n_D - 1)](\lambda^{-3.4} - \lambda^{-3.4}_D)/(\lambda^{-3.4}_F - \lambda^{-3.4}_C)$. When a glass is not "normal" the actual n differs from that obtained by the formula. For wave lengths between C and F the correction is negligible, being of the order of 2×10^{-5}. In the case of the ends of the spectrum, the glasses which have to be corrected are more numerous and the corrections larger. Even here, however, few glasses have corrections larger than $\pm 6 \times 10^{-5}$. The formula, which differs only slightly from one previously advanced by Conrady, is further confirmed by application to Gifford's results. The bearing of the formula on the secondary spectrum of thin lenses was discussed. H. G. (*C. A.*)

135. Abrasives and polishing powders for glass. JAMES W. FRENCH. *J. Oil Colour Chem. Assoc.*, **5**, 103–110(1922).—A review of the principles of abrasion and polishing, with photomicrographs of etched percussion cracks and scratches in polished glass, and of abrasives and polishing mediums. That polished glass consists of an amorphous surface layer, covering innumerable scratches which etching develops through removal of this surface layer, does not seem to be correct. The polishing process on glass consists of wearing away all parts of the surface to a common level, and not of the formation of an amorphous surface layer which bridges over cavities, as seems to be the case in certain polished metals studied by Beilby (*C. A.* **8**, 3750). Discussion. F. A. W. (*C. A.*)

136. Heat losses in glass manufacture and their control. KLAFTEN. *Sprechsaal*, **54**, 251(1921); *J. Soc. Glass Tech.*, **5**, 140.—K. divides heat losses into 3 sections. The first section includes losses which are inevitable, such as heat used in the producer to convert solid to gaseous fuel, heat taken away by the ash, and heat lost by gas waste during reversal. In this class also are placed losses occurring at working and other openings in the furnaces. The second group contains losses which can be obviated or reduced, such as those caused by bad regulation of the producer (entailing premature burning of the gas or loss of unburnt fuel in the ash), and losses at poking holes where not carefully constructed. This section also includes heat losses caused by incomplete burning of the gas in the furnaces, due to incorrect air supply or to faulty design of burners, chambers, or flues. Another source of loss, the conduction and radiation of heat, can be minimized by the use of suitable insulating materials. In the third section are grouped losses which are not recoverable in one direction, but which can be made use of in other ways. Among these are included the use of heat from the generator for drying moist fuel, of heat from the waste gases for drying fuel or heating the room, and finally, of the use of heat lost by the furnace crown to warm the blast or secondary air. The following figures for the heat balance of a plant are given. Of every 100 cal. of

heat supplied 95.5 came from the producer and 4.5 from the steam. Useful heat for melting glass amounts to 12.5 cal., while 12 are recovered from waste gases. The heat losses are 15 cal. in the producer, 4 in the flues, 0.5 during reversal, 6 in the regenerators, 20 by conduction and radiation from the substructure, and 23 from the superstructure, 7 lost in chimney waste gases and radiation from the brickwork.

H. G. (*C. A.*)

137. The structure of abraded glass surfaces. F. W. Preston. *Trans. Optical Soc.*, **23,** 141–64(1922); *Naturwissenschaften*, **10,** 517–9.—A study of the physics of ground and polished glass surfaces. The object is to substitute the conception of a flaw or fissure complex for the current view of a hill and hollow structure. The enhanced soly. of ground surfaces in HF is shown, and from this soly. is estd. the thickness of the flowed or surface tension layer. The grains of abrasive are dragged over the surface, producing chatter and diamond cuts, percussion flaws, cascade cuts and intermediate forms. The hills and hollows do not represent the full depth of fractured layer, for below is 2–3 times the depth of flaws. French (*Trans. Optical Soc.*, Nov., 1916) contended that there is a flowed (*"beta"*) layer approx. 8 wave lengths deep. By etching with HF and detg. the rate of soln. for the surface layer and for that below the crit. depth, P. attempted to confirm or disprove this. A comparison of a disk-cut surface with a grayed surface showed that HF attacked the former only 0.3 as fast as the latter. A grayed surface was attacked 11 times as quickly as a polished one. The rapidity of HF attack on a grayed surface quickly decreased, becoming the same as that on a polished one. The rate of attack on the polished surface remained const. It is concluded that if there is a *"beta"* layer 8 λ deep, it does not differ in soly. from the massive *"alpha"* material. The high initial rates on grayed surfaces can be due either to a surface area 10–12 times that of the polished apparent surface or to the surface material differing radically from the massive. From the Twyman effect it is shown that the surface is under excessive strain. It is, therefore, judged that both effects are present, an increased area due to chatter-flaws and an enhanced soly. due to strain. It is shown by etch patterns that there is a detail of a few millionths of an in., and this could not exist in a flawed surface tension layer. So if glass has a flowed layer it is only 2–3 millionths in. thick. Feldspar and quartz were much more resistant to HF than glass. The structure of glass was developed in 15 sec. in 2 *N* HF at 15°, whereas feldspar required 5 min. and quartz 7 min. with 5 *N* HF. Etching of apatite and fluorite with H_2SO_4 suggested a certain plasticity of their crystals. C. C. D. (*C. A.*)

138. Grease for molds. Anon. *Sprechsaal*, **54,** 6, 67(1921); *J. Soc. Glass Tech.*, **5,** 103–4.—The following formulas for grease for molds in which goblets are blown give a high brilliancy to the glass, and also resist dislodgment by water into which the mold is dipped. (1) A mixt. of very finely ground pure charcoal with resin is spread over the mold by a gathering of hot glass. (2) The mold is warmed and coated, not too thickly, with linseed oil or thick varnish. Charcoal, very finely ground and sieved (preferably through coarse canvas), is then uniformly spread over by a sieve. (3) Equal parts of varnish and resin are melted together for 1–2 hrs. and, on cooling, a third of red lead is added. After coating the mold evenly and spreading with fine charcoal, it is heated in the furnace or allowed to stand for $2^1/_2$ hrs. H. G. (*C. A.*)

139. The chromate-albumin copying process as an etching basis for glass, etc. C. Fleck. *Sprechsaal*, **54,** 340(1921); *J. Soc. Glass Tech.*, **5,** 126–7.—The soln. for coating the glass consists of: distd. water, 1000 cc.; NH_3 (sp. gr. 0.960), 20 cc.; albumin, 50 g.; $(NH_4)_2Cr_2O_7$, 7 g. The results are satisfactory only when distd. water is used. For the prepn. of the soln., the best method is to dissolve the albumin in 275 cc. of water, beat up, and run in the soln. of dichromate in the rest of the water, shaking together, and then filtering carefully through a cotton-wool wad. The plate to be etched is cleaned

by rubbing with the following mixt.: sieved whiting or powd. charcoal, 20 g.; NaOH, 2 g.; water, 50 cc alc., 50 cc. After cleaning and washing off all solid grains from both sides of the plate, the clean surface is covered with the albumin soln., excess being drained off. Drying is performed in an app. for rotation over a hot iron plate; care is needed not to prolong the heating unduly, otherwise coagulation of the albumin results. The pattern is printed on the prepd. plate from the negative in a copying frame, time of exposure being one to two min. in summer sunlight, two to three min. in the winter sun, and ten times as long in diffused light (too great exposure hardens the prepn. and prevents the absorption of color). The colors applied are generally printing colors, often thinned down with lavender oil. Such a color can be made as follows: rectified turpentine, 50 cc.; powd. Syrian asphalt, 10 g.; good illustration color, 40 g. The above can be melted together and filtered into a box or bottle. Colors which contain wax or tallow do not give sharp copies, and, if applied to designs with fine, close lines, they give a confused result on burning in. The color is applied by evenly rolling into the plate, and the pattern then developed by laying the plate in water and washing with a soft sponge or pad, using a rotatory motion. After washing with water, the plate is dried in the app. for rotation and fine asphalt powder is shaken over it; the surface is dusted with a wad, freed from the last traces of dust with talc and a powder puff, and the design burnt in. Everything outside the copy is covered with shellac, which was dried. Finally, the design is etched with a strong etching soln., so that, after etching, little color distinction remains, and a relief is obtained which can be felt when rubbed over.

H. G. (*C. A.*)

140. Modern glass factory equipment. W. S. Mayers. *Glass Ind.*, **3**, 197–9 1922.—A discussion of the *fan system of air cooling.* J. B. P. (*C. A.*)

PATENTS

141. Furnace. F. O'Neill. Brit. Pat. 179,977, Jan. 12, 1921. Ill. Off. Jour. Pats., July 12, 1922. Describes arrangement for delivering uniform charges of molten glass from a tank furnace. Sketches of mech. details. Wm. M. Clark

142. Crucible furnaces for manufacturing glass. Kosuke Hirano. Japan, 39,936, Sept. 14, 1921. Addition to 35,365. Diagrammatical description. (*C. A.*)

143. Apparatus for testing glass containers. O. C. K. Hutchinson. U. S. 1,427,817, Sept. 5. Glass bottles or the like are carried on a conveyor between electrodes which subject them to a spark to detect pin holes or cracks. (*C. A.*)

Enamel

144. Standardization of enameled apparatus for chemical purposes. Emerson P. Poste. *Chem. & Met. Eng.*, **27**, 1016–19(1922).—A paper presented at 8th Chem. Exposition, on Ceramic Day, Sept. 15, 1922. Describes standardization as regards types of enamels to withstand varying degrees of corrosive action, materials of construction, uses, and methods of temp. control on app. R. R. Danielson

145. Growth of cast iron. (From report by Tario Kikuta, *Jap. Iron & Steel Inst.*) *Chem. & Met.*, **27**, 510(1922).—Growth of cast iron in heating is attributed to two different causes; (1) internal oxidation, (2) expansion of occluded gases. K. measured the leakage of gases through a gray cast iron tube at room temp. and at 960°C. Leakage at high temp. was only slightly less. It is therefore improbable that air enters at low temp. and cannot escape at high temp. Tests in vacuo show that growth is not due to oxidation. K. concludes that growth is due to decomposition of cementite and to formation of minute fissures caused by differential expansion of various micro portions.

R. R. D.

PATENT

146. Enameling. L. DE RAPHÉLIS-SOISSAN. Brit. 982,788, July 3, 1922. To support and fix the enamel powder on metal the articles are coated with a porous non-carbonizing substance such as asbestos, mica, pumice stone, or infusorial earth, in powder, fiber, or sheet form, and the enamel is painted thereon or may be previously incorporated therewith. The articles are then shaped and fired. (*C. A.*)

Cement, Lime and Plaster

147. Gypsum withstands fire. ANON. *Contract Record,* **36,** 961(1922).—Expts. at Chatham, Ontario, Canada, demonstrated the effectiveness of gypsum as a fire resisting material. A building was erected by the Ontario Gypsum Co., at Chatham, with gypsum board on wood studding; this was filled with dry hay, wood, oil and other combustible materials and set on fire. The heat was terrific but the fire was allowed to follow its own course and after it died away a stream of water from a fire hose was turned upon it. Outside of being blackened and stained by smoke, the house was uninjured and examination showed that the studding and frame work beneath the gypsum board were uncharred and in as good condition as when first erected.

O. P. R. O.

148. Lime bricks. HENRI SERVANGE. *Raw Materials Rev.,* **1,** 88(1922). France claims to have produced lime-bricks from raw chalk of limestone waste and clay or sand, by mixing sand or clay in any propn. with chalk and pressing the product wet. The pressed goods are heated in a brick kiln to an easy red glow, 500° to 550° C, which corresponds to the temp. of the decompn. of slaked lime. At the same time the atm. in the kiln is kept moist by forcing steam into it, in order to obviate the complete desiccation of the bricks. The too rapid escape of the carbonic acid must be prevented by the use of proper slides, as its presence is indispensable for hardening the monocalcium-hydrosilicate. After a few hours of this treatment, the bricks will have become exceedingly hard when they can be removed from the kiln. O. P. R. O.

149. Structural materials tested. HYDRO-ELEC. POWER COMM. OF ONTARIO. *Annual Report,* p. 275, 1921–22.—The activities of the structural materials lab. may be classified into 3 divisions: cement testing; concrete testing; and testing of miscellaneous structural materials. To this might be added coöperative activities in conjunction with national organizations, such as the Canadian Eng. Standards Assoc., in carrying out technical investigations and in the preparations of specifications. A considerable decrease in the cost of testing and inspection is the result of the research work carried on in the laboratory of the Hydro-Electric Power Commission. O. P. R. O.

150. Fuel and cement kilns. ANON. *Times Trade Supp.* (London), **11,** 19 (1922).—The research into rotary kilns for cement burning made by the British Portland Cement Assoc. on a £ to £ grant from the Dept. has given results that are already incorporated in the practice of cement works, and show a saving of 4 to 5% of coal and an increased output of ten per cent of cement. One firm alone is saving £25,000 a year in its fuel bill as it was before the Armistice. O. P. R. O.

151. New system of concrete construction. ANON. *Canadian Engineer,* **43,** 413(1922).—Concrete houses are now being constructed in Gr. Br. by a new method known as the "Wilkielock," system which consists of making the outer walls of clinker concrete slabs, $2^1/_4$″ thick, faced with $^3/_4$″ cement mortar, a $4^1/_2$″ space being left, while the inner slabs are made of coke breeze and cement, also $2^1/_4$″ thick. The result, it is stated, is that warmth is obtained without condensation. O. P. R. O.

152. Anhydrite as building material. ANON. *Raw Materials Rev.,* **1,** 180(1922).—"Chemiker Aeitung" states that the large beds of anhydrite in the Hartz could be utilized

by grinding the decomposed product with small additions of 3.5% of lime, and the result would be a building material that could be used for walls, ceilings, floors, and artificial stone, etc. Like any gypsum, it must not be exposed to continuous wet without protection. The tests of the Prussian Geol. Land Bur. also confirm the applicability of anhydrite. O. P. R. O.

153. Sand-lime bricks. H. O. WELLER. *Dept. of Scientific & Industrial Research.* Building Research Board. London (1921).—"Mortar bricks" were made by an Englishman above 80 years ago; they were a mixture of sand and lime, hardened in the air; which process took from 6 to 18 months, developing a very small amount of calcium silicate. As a result of subsequent improvements Michaelis of Berlin took out his master-patents for true sand-lime (calcium-silicate) brick 40 years ago; his process, modified, is now exclusively used. Any clean siliceous sand, from quarry, pit or river, may be used; many other refractory and waste materials or by-products, such as slag, clinker, shale, quarry-waste, shards, etc., are suitable. The only other necessary material is lime. O. P. R. O.

154. Thermochemistry of (cement) vertical kilns. J. B. *Rev. Mat. Constr. Trav. Pub.*, **156,** 169–172(1922).—In burning materials for cement the following reactions take place, (*a*) fuel is burned to give CO_2, H_2O and SO_2. (*b*) carbonates of calcium and magnesium are decomposed to their oxides and CO_2. (*c*) in some calcareous materials org. matter and sulphur burn. (*d*) lime reacts with silica and alumina, the mass undergoing incipient fusion. It is known that reactions (*a*) and (*c*) produce heat, and that (*b*) absorbs heat. Berthelot and Le Chatelier maintain that reaction (*d*) is exothermic, while Timm states that it is slightly endothermic, and Stanger and Blount that the evolution of heat is practically negligible. A numerical example is given accounting for all the heat put into the furnace, heat absorbed and heat lost.

LOUIS NAVIAS

155. Gyratory crushers. G. C. *Rev. Mat. Constr. Trav. Pub.*, **156,** 175–9(1922). —A tech. description of the parts of the "Atlas" gyratory crusher. (With 4 cuts.)

LOUIS NAVIAS

156. Effects of alkali on concrete in prairie provinces. T. THORVALDSON. *Contract Record*, **36,** 953(1922).—The problem of the so-called action of alkali on concrete is generally considered to be peculiar to the prairie provinces of Canada and the corresponding States in U. S. The result of the low rainfall and poor drainage is the cause for presence in the soil of a large amount of sol. salts. Analyses of waters from the 3 provinces show that the dissolved salts are, in general, mainly sodium, magnesium, and calcium sulphates, with occasionally a large quantity of common salt. Until lately all failures of concrete were attributed to defects in the cement or concrete. Failures of some concrete structures exposed to sea water were considered by some as due to the salts. Of late it has been the general opinion in Great Britain that well-made constructions of dense concrete will stand up indefinitely when immersed in the sea but well-made concrete manufd. from the best materials will not stand up long if in contact with certain ground waters. Experiments on the preparation of concrete using water containing a high concentration of alkali salts indicate that the early development of strength through hydration is not interfered with. Cement briquettes will develop nearly full strength when cured in sulphate solutions of a concentration which later causes disintegration. Thus the alkali disintegration seems to be so slow in its action that the effect on the fairly rapid process of hydration is not noticeable. It is, therefore, likely that the action of the alkali is on the products of hydration of the chemical compounds in cement clinker. The free lime produced during the hydration of the calcium silicates in the cement has a slight solubility in water. On account of the low solubility and the consequent tendency to attain equilibrium in a thin film of

liquid on the surface, the extraction of hydrated lime from cement by pure water is slow. However, fair-sized crystals of hydrated lime may form on the surface of briquettes stored in distilled water. This leaching out of hydrated lime progresses most rapidly in the case of cements high in tricalcium silicate, while cements in which dicalcium silicate largely predominates are not so active. This statement holds in practice for specimens of equal permeability to water, and since dicalcium silicate after setting is much more porous than tricalcium silicate this advantage of the lower silicate disappears in practice. If bicarbonates or carbonates are present in the water these react with the hydrated lime forming insoluble calcium carbonate which may form a protection against further removal of lime and a partial protection against the action of sulphates from the outside. However, this protection is usually quite inefficient, at best, delaying the sulphate action somewhat. When sulphates are present in the water, in contact with the concrete, the conditions are entirely changed. The calcium of the hydrated lime reacts with the sulphate radical and calcium sulphate is formed. The solubility product for this substance is low, and the presence of a large concentration of the sulphate ion will therefore render it almost insoluble. It separates out of solution as the hydrated form of gypsum. The removal of the calcium from solution in this manner upsets the equilibrium between the dissolved and solid hydrated lime and speeds up the leaching out of this substance from the cement, while the moment it enters solution the calcium continues to be precipitated as gypsum. If the sulphate present is sodium sulphate, the liquid attains caustic alkalinity, while the sulphate disappears as gypsum into the solid phase. On the other hand, if magnesium salts are present as well as the sulphate, the hydroxyl ion is removed neutral, while both the magnesium and the sulphate radicals disappear from the solution and enter the solid phase. Thus the presence of dissolved magnesium salts and sulphates in water which is in contact with cement or concrete, produces ideal conditions for the constant removal of lime from the lime silicates in the cement, with the consequent weakening of the concrete and when carried to completion final loss of all cementing properties. The theory that the disintegration is due to the physical forces exerted during the crystallization of gypsum in the voids in the concrete can hardly stand as a sole explanation. It, no doubt, contributes to the final results by causing fissures in the weakened concrete and thus facilitating the access of the harmful sulphate waters to the interior portions of the concrete. At present the only remedy known is the manuf. of concrete of low permeability and high strength and this is only an expedient for lengthening the life of the structure.

O. P. R. O.

157. Fundamental physical and chemical properties of commercial lime. I. The available lime content. M. E. Holmes and G. J. Fink. *Chem. Met. Eng.*, **27**, 347–9 (1922).—Quick-lime and hydrated lime are defined and the line of investigation to be followed in the series of papers on this subject indicated. Titrametric methods of detg. the available CaO are described and the available CaO % on non-volatile basis is shown to equal: (% available CaO in samples as used)/(100 — loss on ignition). Tables show the available CaO content of typical Ca quicklimes in their corresponding hydrates and similar data on typical Mg limes. The tables emphasize a great variation in the available CaO content. The tendency is to have a higher available lime content than the corresponding hydrates as detd. by the A. S. T. M. method. Data show that it is possible to hydrate so as greatly to minimize this tendency. Reduction in the available CaO content during mech. hydration and mech. treatment may be due to mod. aggregation whereby a portion of the CaO is rendered physically unavailable or due to mole transformation by local burning during hydration converting some of the CaO into a less sol. form. The state of moisture and local temps. in the hydrator may cause chem. reactions tending to produce a small percentage of an insol. product

W. H. R. (*C. A.*)

158. Thermal conductivity of white marble and "Neat" cement. Roy A. Nelson. *Phys. Rev.*, **18**, 113–5(1921).—Thermal conductivity of "Alabama White" marble and of "Neat" cement was measured by the cylinder method at the following temps.: 50° to 100°, 100° to 150° and 150° to 200°. For marble the values 0.00614, 0.00524, and 0.00415 and for "Neat" cement 0.0014, 0.00165, and 0.00146 were obtained. The marble was principally $CaCO_3$ with a small amount of $MgCO_3$. The "Neat" cement was made of Portland cement and water. D. MacR. (*C. A.*)

159. Heat efficiency increase in cement burning. H. Larmour and W. C. Stevenson. *Concrete* (Cement Mill Section), **19**, 95–6(1921).—L. and S. submit the design of a proposed preheating bin for raw mixts. The bin is placed at the upper end of the cement kiln and all raw mix entering the kiln receives a preliminary heating in the bin, from the kiln gases on their way to the stack. The bin is fitted with 36 vertical tubes, 16 ft. long and 10 in. in diam. Such an installation should increase the output of the kiln, recover some of the dust ordinarily lost, and reduce the fuel cost per barrel of cement by 24%. J. C. W. (*C. A.*)

160. Kiln efficiency discussed. C. O. Sandstrum. *Concrete* (Cement Mill Section), **20**, 48–9(1922).—**Heat efficiency increase in cement burning.** C. E. Burgoon. *Ibid.*, 77.—Discussions of the paper by Larmour and Stevenson (cf. preceding abstr.). J. C. W. (*C. A.*)

161. The measurement of the temperature of rotary cement kilns. R. Nacken and G. Schoppe. *Zement*, **10**, 581–4, 595–7(1921); *Chimie et industrie*, **7**, 1149(1922).—The temps. were measured by means of Pt-Rh couples placed at 6-m. intervals in the shell of a 60 m. by 3 m. kiln. The results are plotted with the revolutions of the kiln as abscissas and the temps. observed at 60° intervals as ordinates. At 10 m. from the mouth of the kiln the av. temp. of the material was 50°. At 24 m. there is already a difference between the temp. of the clinker (K) and that of the gases (G). If the kiln is turning counter-clockwise, the max. temp. for each revolution is at a point 60° to the left of the lowest point, while the min. is at points 60–120° to the right of the lowest point. The av. temps. are $K = 350°$ and $G = 450°$. At 37 m. $K = 930°$, $G = 1060°$. The dissociation of $CaCO_3$ is hardly beginning, as it takes place at a higher temp. in an atm. rich in CO_2. At 45 m. $K = 969°$, $G = 1290°$. The lower value of K is due to the decompn. of $CaCO_3$, which requires 42.5 cal. per kg.-mol. of $CaCO_3$. At 48 m., *i. e.*, 3 m. back of the zone where the lime is burned, $K = 1255°$, $G = 1295°$. At 50 m. they are 1310° and 1345°, resp. G reaches a max. of 1430° at a distance of 52 m., but G does not rise as much (1360°) owing to the absorption of heat by the partial fusion of the clinker. At 54 m. G falls to 1410° while K remains practically the same. The burning is almost complete at a distance of 56 m. A. P.-C. (*C. A.*)

162. Defects in the manufacture of Portland cement, and their causes. A. Heiser. *Tonind. Ztg.*, **46**, 63–4, 79–81(1922); *Chimie et industrie*, **8**, 613(1922).—In one instance, owing to a leak in the H_2SO_4 app., CO_2 escaped, and deficiency of $CaCO_3$ was found. An excess of $CaCO_3$ was added, which gave an expansive cement. Another plant using the dry process and a rotary kiln turned out expansive cement owing to an excess of 1% of $CaCO_3$. In the case of a cement which set in barely 15 mins., the addition of 1% of plaster made it set in several hours. With respect to the spontaneous transformation of slow-setting into quick-setting cement, H. advizes mixing slow-setting cement in silos contg. large quantities of cement whilch have already undergone the transformation; also, increase the lime content, thoroughly moisten the clinker, add the max. amt. of plaster, and do not grind too fine. All the above mentioned cases of expansion were due to the presence of free lime. A. P.-C. (*C. A.*)

163. Cement industry in China. J. M. Clements. *Concrete* (Cement Mill Section), **21**, 44–7(1922).—An account is given of the 5 cement plants in China. J. C. W. (*C. A.*)

164. Increasing the resistance of cement to sea water by the addition of trass. A. HAMBLOCH. *Zement*, **11**, 53–4(1922); *Chimie et industrie*, **8**, 614(1922).—Grün (*Ceram. Abs.*, **1** [8], 219) advises the addn. of pulverized sand instead of trass (to blast-furnace-slag cements) as the sand would give the same results and cost less than the trass. There are other factors which affect the compactness of the cements exposed to the action of sea water, and more particularly colloidal action, which is entirely lacking in sand. Moreover, trass has a chem. action in the hardening of concrete owing to the combination of the Al_2O_3, the CaO and the alkalies with the sol. SiO_2 under the action of the hydrosilicates, which action is comparable to the zeolitic phenomena observed in nature.
A. P.-C. (*C. A.*)

165. Change in volume of Portland cement and of concrete. ANON. *Zement*, **11**, 27–9(1922); *Chimie et industrie*, **8**, 613(1922).—The av. heat expansion coeff. of concrete is 0.00055% per degree F. Its expansion under the action of moisture may be 100 to 500 times as great. When a bar of cement is taken out of water it gradually contracts for 60 days. When put back in water it undergoes considerable expansion during the first week, and much less during the following weeks; the total elongation is 0.15%. Neat-cement bars were observed during 6 years. During the last years they were subjected to 4 periods of moistening and desiccation; the same variations occurred each time, and at the end of 6 yrs. the elongation was 0.08% greater than at the end of 3 yrs. the expansion and contraction can be regulated by adjusting the conditions of moistening and desiccation. These facts are explained by Michaelis' colloidal theory of the setting of cements. To test the effects of atm. humidity, the cement bars, after complete drying, were subjected at room temp. to an atm. satd. with moisture. After 3 months' expansion was 0.10%. Analogous expts. with hot water gave practically the same results as cold water. A. P.-C. (*C. A.*)

166. Utilization of waste heat from rotary cement kilns. JOSEPH BROBSTON. *Mech. Eng.*, **44**, 517–8(1922).—Examples are given of waste heat boilers installed in cement plants, showing a reduction from 30 to 40% of the coal consumption.
L. A. P. (*C. A.*)

167. The testing of trass. ANON. *Tonind. Ztg.*, **46**, 90–2(1922); *Chimie et industrie*, **8**, 614(1922).—"Trass" is defined as finely ground waste from volcanic tuff quarries, of such nature that when mixed with $Ca(OH)_2$ it can set either in air or under water. The official German specifications and methods of testing are given.
A. P.-C. (*C. A.*)

168. The dispersoid chemistry of gypsum. II. Research on anhydrite. H. NEUGEBAUER. *Kolloid-Z.*, **31**, 40–5(1922).—There are 3 forms of water-free $CaSO_4$; estrich gypsum formed by drying at 800° (it will set in water), dead-burned gypsum, and sol. anhydrite. The 3rd variety is formed by heating at about 100° under atm. pressure. It always contains as much as 4% of water. The rate of hydration of these forms was tested by measuring the viscosity of 3% suspensions at short intervals. Some com. prepns. of anhydrite show a rapid increase in viscosity indicating rapid hydration. F. E. B. (*C. A.*)

169. High-strength cements. JEAN HENDRICKX. *Chimie et industrie*, **8**, 296–304 (1922).—The quality of artificial cement depends mainly on its physico-chem. compn., burning and cooling, and fineness of grinding. H. proposed (*Le Ciment*, 1920) the following compn. formula: $x SiO_2.2.5CaO + yAl_2O_3.3CaO + zFe_2O_3.3CaO$ (by wt., not equivs.), and $SiO_2/(Al_2O_3 + Fe_2O_3) < 2.5$ and > 1.8. The latter is called the "SiO_2 modulus." By using more CaO than is given by the max. of the formula there is no great increase in strength, but danger of swelling. By using less than the min. the strength falls off. The following method (*Le Ciment*, 1920) is proposed for detg. the "burning quality." One g. of the mixt. is partially burned under standard conditions,

and the residue insol. in acids and alkalies is detd. with a compn. agreeing with the above formula, if the residue does not exceed 7.5% the "burning quality" is satisfactory. A lower limit (generally about 6%) can be readily fixed when SiO_2 must be added to raise the SiO_2 modulus. In order to det. if possible the reason of abnormally high strengths which are occasionally encountered, H. undertook a series of researches comprising: (1) chem. and spectroscopic analyses; (2) petrographic investigation of crystn. and clinkering; (3) physical tests in connection with fineness of grinding. Considerable work remains to be done, but some interesting results have already been obtained. (1) No trace of Be could be detected, but Ti is probably present. (2) Examn. of thin sections of two samples taken from the same batch of fused aluminous cement which had been differently cooled seems to show that this cement is a mixt. of silicates and aluminates and does not consist of aluminates crystd. in an Fe silicate as was believed at first. The examn. of 6 samples taken from a kiln under different conditions of burning and cooling showed that slow burning gives as good results as quick burning, provided that in the first case the clinker is cooled in water, while in the second case it should be cooled slowly. Two kinds of crystals are distinctly visible under the microscope, polarizing and non-polarizing; the latter seem to be more important as far as quick setting and high initial strength are concerned. (3) The amt. of residue which does not pass a standard sieve is not a criterion of the abs. fineness. The method and time of grinding and the sp. hardness of the material affect the abs. fineness, even when the sieve test gives the same results. The wt. of a 1. of the pulverized material, as generally detd. in the lab., decreases rapidly with the degree of fineness, while the sp. gr. as detd. by the LeChatelier-Candlot volumenometer remains practically const. The ratio (sp. gr.)/(wt. per 1.) is called the "modulus of fineness" and is used as a measure of abs. fineness. Tests carried out on 100 samples ground in a small Alsing mill and having practically all the same residue on a 4,900 mesh (presumably per $cm.^2$) sieve, and on 50 samples ground industrially, showed that the higher the modulus of fineness the better the quality of the cement, that with a modulus below 2.6 cements with high initial strength cannot be normally obtained, and that the modulus of fineness does not have the same effect on all cements, thus showing the importance of the crystalline form. A. P.-C. (*C. A.*)

BOOK REVIEWS

NOTE.—Under this heading we will give analytical reviews of those books which will be practical additions to the library of the manufacturer, practical potter, ceramic decorator and student. A publisher's announcement rarely describes a work from a pottery man's point of view, and as a result it is no simple task for the latter to select and find just those books which will furnish essential data (if such exists) covering some phase of his particular activity. If a book is of general interest only, or if it specializes on some particular type or branch of the work, such facts will be presented for the consideration of those interested.

Creative Impulse in Industry. HELEN MAROT. E. P. Dutton Company. 3rd. printing. 1919. $1.50.

A survey of industrial conditions made for the Bureau of Educational Experiments. Apparently written during the War with the intent to find a way not only to increase industrial efficiency in this country, but to do this with the interested coöperation of the workers.

The author's point of view is at once apparent in the following abstracted statement:

"All productive force is artificially sustained which is not dependent on men's desire to do creative work."

If there is a business in the United States that needs increased efficiency, it is that of the clay worker, and any sincere and authoritative attempt to show how this can be

done should surely be investigated. The manufacturers in the clay industries will read this book with mixed feelings, because it is probably the strongest indictment of the prevalent organization attitude towards the workers, that has yet been written.

The progressive organization official has followed the researches of Taylor and other efficiency engineers and has, as far as conditions will allow, adopted policies which at least prove their superiority over the previous grossly inefficient custom (for it cannot be called a system), where ignorant, incapable, disinterested and unreliable persons are put in charge of important industrial activities and placed in positions of authority over large numbers of people.

But, however much the human interest may be lacking in an organization, a system which will result in doubling production without an increase in cost is twice as efficient as the system that it superseded. This much must be accepted or one cannot read Miss Marot's book without a feeling of impatience and, finally, resentment.

Frederick W. Taylor has at least succeeded in convincing the large manufacturer of the importance of efficient shop operation, and it may be added that this was not done by means of literary reviews, but by years of active demonstration in some of the largest industries in this country.

If Taylor's "Principles of Scientific Management" and Miss Marot's book were side by side in a book store and superficially examined by an interested executive, we know which one he would purchase and carry away. It would not be "Creative Impulse in Industry." But this does not mean that this book is less valuable than Taylor's, or that it should not be in the possession of everyone concerned with production of every character.

Few industrial authorities will disagree with Miss Marot's conclusions. In fact, they are already accepted by a number of large manufacturers. Everybody knows that an interested worker is likely to be more efficient than a disinterested worker, and that an organization of interested workers is infinitely more productive than a disorganized, disgruntled organization. For obvious reasons, even the most conservative manufacturers are giving some attention to the social, educational and industrial conditions among the working classes as they exist today. But there are so many inimical conditions to a rational and business-like program as presented by Miss Marot, that it is quite definite that from twenty-five to thirty years will elapse before any educational movement in the direction of increased efficiency is generally tolerated.

The Unions will fight to the last ditch any activity that tends towards either making the worker satisfied or interested in his job. The workman must be discontented and he must be inefficient, or he cannot be a Union member in good standing. It is only necessary to take notice of the present sanitary ware strike. Here is a case where the unions compel the worker to limit the production to the point where anything like a reasonable productive efficiency is impossible. Various authorities agree that we must give speedy attention to the problems of industrial training. In fact, we are already doing this. But as stated, it will be at least two generations before we will have a condition where the labor element of the country is interested enough in creative or productive effort to have the desire to be efficient. However, there is no doubt that such books as this will contribute to bring about such a desirable condition.

Chinese Ceramics. J. J. Marquet De Vasselot and M. J. Ballot. (Published by Albert Morance. Paris. 1922.) Brentano's, New York. 2 vol., $18.50.

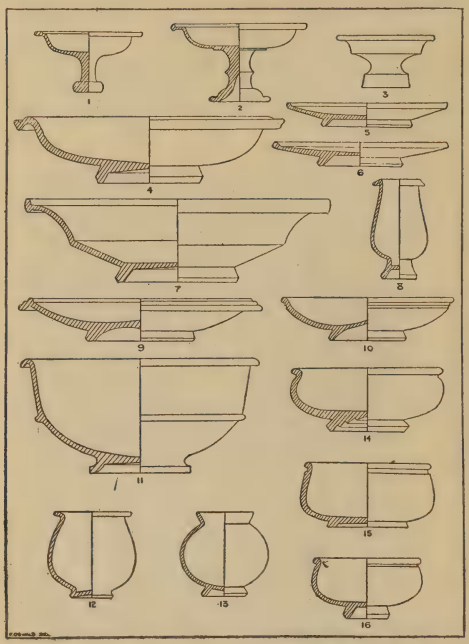
Two compact folios, 9″ x 7″, containing eighty odd lithographic reproductions of Chinese vases in the Louvre Museum. Most of the plates are in color. The first volume deals with the Han-Ming periods (206 B. C. to 1643), and the second follows the K'ang Hsi, Yung Cheng, and Ch'ien Lung periods and on to the present day (1662 to 1911).

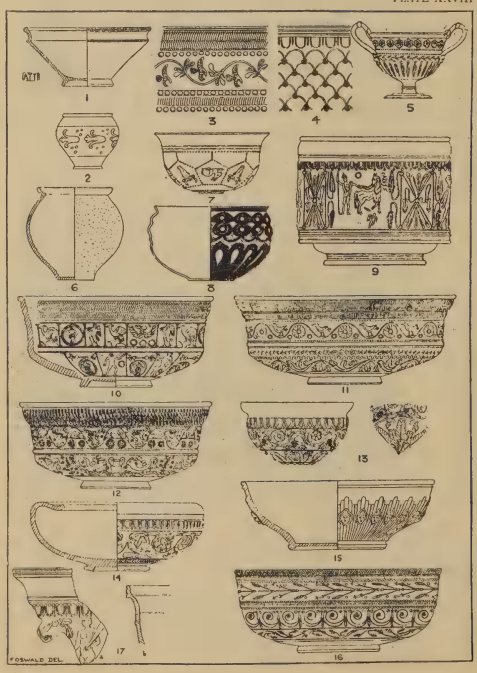
Interesting and authoritative historical reviews accompany each volume. There are also reproductions of marks, and a short list of works of reference.

While the most noticeable omissions in this collection are those of examples of some of the finer figures of the Han period, and the monochromes of the K'ang Hsi period, the collection as shown is fairly representative, and the work as a whole is a notable addition to existing works on Chinese ceramics.

The first volume is particularly interesting, and the plates of the Ming polychrome figures and vases are beautifully reproduced.

The value of such a work as a reference for the American collector is obvious, but it possesses yet far more practical value for the manufacturer of art wares, the modeler, the ceramic engineer and decorator.





An Introduction to the Study of Terra Sigillata. FELIX OSWALD AND T. DAVIES PRYCE. Published by Longmans, Green and Co., New York City. 1920. $16.50.

A profusely illustrated study of the "Terra Sigillata" or more commonly known "Samain" ware.

A general description of the Italian Sigillata (Arretine Ware), and the provincial Sigillata is given, and the various developments are chronologically treated.

There is quite a complete bibliography, and the eighty-five carefully drawn plates show some fifteen hundred ceramic forms and decorative details.

The book is a comprehensive and scholarly archaeological study, and it will find its place in the various libraries as such. But we are concerned with its value to the potter, for here is a wealth of material and information such as the art potter, terra cotta and faience manufacturer have been looking for, for many a day.

There is page after page showing decorative treatments, motifs, and shapes developed during the various periods in which these were produced. The latter part of the work is devoted almost entirely to shape construction drawings which will be particularly valuable as references for the shape designer and modeler. Many of the decorations are typically terra-cotta treatments, and as such, the book should be received with great interest by the architectural ware people.

F. H. RHEAD

Laboratory Manual of Colloid Chemistry. HARRY N. HOLMES, Professor of Chemistry in Oberlin College. John Wiley and Sons, Inc., New York; Chapman and Hall, Limited, London, 1922. xii+127 pp., 32 figs. 23.5 x 15 cm.

It was at the suggestion of the Colloid Committee of the National Research Council that this most excellent manual was written by Dr. Holmes and this committee deserves much credit in the selection of the author. The subject matter is taken up under the following sixteen chapter headings: Suspension; Dialysis and Diffusion; Condensation Methods of Preparation; Dispersion Methods of Preparation; Coagulation; Protective Colloids; Solvated Colloids; Surface Tension; Emulsions; Viscosity; Adsorption from Solution; Adsorption of Gases; Reaction in Gels; Experiments with the Ultramicroscope; Soils and Clays; Special Topics. There are in all 186 experiments carefully selected to illustrate the principles involved and accompanied by short discussions of the theory, in which many references are made to the current literature, The manual also contains a short but excellent bibliography. It is so written that it is admirably suited for use in supervised laboratory courses in colloid chemistry and at the same time equally serviceable for those who desire independently to become more familiar with this subject. Lists of experiments for the following special courses are given: A General Course; A Course for Medical Students; A Course for Students of Ceramics and Agriculture; A Course for Students of Geology; and A Course for Students of Industrial Chemistry. The book is well written and has already proved to be a valuable addition to the Colloid Chemical literature. W. G. FRANCE

Henley's Twentieth Century Formulas, Recipes and Processes. Edited by Gardner D. Hiscox, M.E., The Norman W. Henley Publishing Co., New York City. 1922. $4.00.

Containing over seven hundred pages of formulas, recipes and processes for the workshop and practical man. Acid-proofing, Adhesives, Alloys, Aluminum and its treatment, Amalgams, Bronzing, Brass Casting, Celluloid, Cements, Dyes, Enameling Explosives, Glass, Inks, Jewelers' Formulas, Lacquers, Lubricants, Photography, Plating, Rust Preventives, Soaps, Solders, Artificial Stone, Varnishes, Waterproofing, Wax, are only a few subjects selected at random. The technical man will smile during his perusal of the ten pages of old-fashioned (but reliable) formulas under the heading of ceramics, but this will not prevent the book from being what is claimed for it; "a useful reference work for the mechanic, manufacturer, artisan and the general home worker."

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[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts* by coöperative agreement.

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General and Miscellaneous

1. Chemical industry in Greece. C. D. RAWLINS. *Chem. Trade Jour.* (London), **71,** 231(1922).—The chem. indus. in Greece is making progress. There are 4 factories for the manuf. of glass and pottery with up-to-date plants. Fertilizers are made in one large factory. Sulphuric acid is also manufd. out of local pyrites. There is one factory for the manuf. of aniline dyes; soap and sulphur oil are old-established industries and turpentine oil and colophon are distilled from local pine resin. O. P. R. O.

2. Bentonite used in the de-inking of paper. ANON. *The Chem. Age,* **7,** 668 (1922).—Bentonite, the natural mineral substance, has been found to be an extremely efficient agent for de-inking old newspapers and has been described as a natural soap on account of its detergent properties. In the exptl. tests with the material on old newspapers, bentonite was used with just sufficient alkali to loosen the ink without discoloring the paper. It was found that the small particles of the mineral could be easily carried through the ordinary washing screen. O. P. R. O.

3. Report of experiments with a gas-producer. TAMOTSU YASHORO. *J. Jap. Cer. Assoc.,* **361,** 424–42(1922).—The author performed 83 expts. with a Dowson gas-producer at the Tsurumi plant of the company. The producer had a water-sealed Thwaite's ash-pit with a steam-blower. It consumed 18,700 lbs. of a Hokkaido coal, consisting of 77.8% lumps, 21.9% medium lumps and 1.2% small coal, per day. It was poked 5 times an hr.—(1) *Temp. in the producer.*—The most suitable temp. of coke-layer was 1000–1100°C. When it was cooled below 800°C, the gas was useless. (2) *Propn. of steam and air.*—The best gas was produced when they were introduced to the blower in the propn. of 75.18% air and 24.82% steam in vol. (3) *Thickness of fire-bed.*—The best results were obtained when the layers of coke and coal were 18″ to 20″ and 17″ to 20″ thick respectively. Besides, descriptions on the removal of ashes, velocity of air and steam passing through fire-bed and the pressure of steam are given. S. KONDO

4. Tests to determine the uses for clay. R. F. MACMICHAEL. *Brit. Clayworker,* **29,** 189(1920–21); *J. Soc. Glass Tech.,* **5,** 28–9.—The general phys. characteristics were

first noted. These included color, hardness, fracture, uniformity, org. matter, foreign material, behavior in crushing, pugging and forcing through dies. Plasticity was detd. by noting the amt. of water required to form a slip of standard viscosity. The clay was blunged, deflocculated to its max. viscosity with a suitable electrolyte, and dild. with H_2O to a standard viscosity. The amt. of water contained in the slip was detd. and was a measure of the plasticity. The wet-strength of the clay was tested in a machine similar in operation to the ordinary cement-testing machine. Blunging and screening through a 200-mesh sieve sepd. the clay into two portions, each of which was dried and weighed and its character noted. Chem. analysis was made as usual. Drying qualities were examd. by drying 100 g. of wet clay in briquet form at 160°F under standard conditions. A balance and shrinkage gage indicated the loss of wt. and shrinkage simultaneously. For tests on dry and fired material, bars half an in. in diam. were expressed on to a grooved board and cut into 5-in. lengths. The bars were then stamped with a sample number and notched with a 100 mm. gage and the av. wet wt. was noted. On these samples drying shrinkage, firing shrinkage, breaking wt. (transverse), warping, loss of wt., porosity, and d. were detd. The point at which a sample sagged under its own wt. on heating was taken as its refractory index. H. G. (*C. A.*)

5. The firing of ceramic products in electrically heated furnaces. ALBERT GRANGER. *Compt. rend.*, **175**, 98–100(1922).—Furnaces heated electrically by Pt wire or by granulated C, were used in lab. tests. China fired white, a ferruginous stoneware red and Sevres porcelain an amber tint, all about like products from the ordinary kiln. Hard porcelain fired gray, and had the appearance of com. porcelain fired in a too highly reducing atm. This gray color is usually explained by the occlusion of C deposited from the flame. In this case the corundum furnace, where no flame existed, was sufficiently porous for CO to penetrate, whereupon it deposits C according to the probable reaction: $2CO \longrightarrow C + CO_2$. This blackening was avoided when CO was eliminated by a moderate draft. C. C. D. (*C. A.*)

6. Some new forms of kilns. A. DUCKHAM. *Engineering*, **114**, 534–6(1922).—Two kilns, one continuous, the other tunnel, are described. The continuous kiln has 16 chambers each 19 ft. wide, 17 ft. long, 6 ft. high at the sides and 10 ft. at the middle. The chambers are in 2 rows of 8 each. There are 4 fireboxes, 2 on each side of each chamber. Fire bricks are burned to cone 13. Fuel consumption is 20–25 tons of coal per 100 tons of brick. Air leakage, chiefly through the main dampers to the chambers, interfered with draft and cast iron flap doors were put in. Artificial draft also was introduced. A new modification with central bags feeding producer gas is described. The tunnel kiln described has a fixed central heating zone and the hot gases follow a zig-zag path. A modification in annular form was devized for burning glazed ware. Excellent drawings are given. C. H. K. (*C. A.*)

7. The dangers of powdered fuel. A. B. HELBIG. *Feuerungstechnik*, **10**, 188–90 (1922).—Coal dust will not burn unless very intimately mixed with air in proper proportions. Mills for powd. coal are not dangerous, even if fed with glowing coal, or pieces of steel that produce copious sparks. Kept in large closed silos powd. coal is not dangerous, so long as these have no dead spaces where the coal is not disturbed. Great cleanliness in the plant, avoidance of dust clouds, and care in igniting coal dust flames will make this as safe as any industrial process. E. W. T. (*C. A.*)

8. Historical sketch of the pottery industry. R. H. MINTON. *The New Jersey Ceramist*, **2** [3], 179(1922).—The paper covers briefly the historical development of porcelain, both oriental and occidental. C. W. PARMELEE

9. Address at the dedication of the New Ceramics Building at Rutgers College. ED. ORTON, JR. *New Jersey Ceramist*, June, 96(1922).—A brief statement of the inception of ceram. ed. in the United States. C. W. PARMELEE

10. Samuel Wesley Stratton. ANON. *Elec. World,* **80,** 860(1922); 1 illus.—Biographical sketch. See also *Bull. Amer. Ceram. Soc.,* **1** [11], 331–32(1922).
C. G. F. (*C. A.*)

11. Stimulating research by organization. T. S. TAYLOR. *Elec. World,* **80,** 961–2(1922).—A clear and concise expression of an ideal research lab. organization.
C. G. F. (*C. A.*)

12. Grasselli Medal award (to Walter H. Fulweiler). Presentation. HARLAN S. MINER. *J. Ind. Eng. Chem.,* **14,** 1154–5(1922). **Acceptance.** *Ibid.,* 1155.
E. J. C. (*C. A.*)

13. Ernest Solvay—an appreciation. WM. H. NICHOLS. *J. Ind. Eng. Chem.,* **14,** 1156–8(1922).—An obituary. E. J. C. (*C. A.*)

14. Federal and state research agencies. W. M. CORSE. *Trans. Am. Soc. Steel Treating,* **3,** 231–8(1922).—An address. W. A. M. (*C. A.*)

15. Research for engineering societies. A. D. FLINN. *Trans. Am. Soc. Steel Treating,* **3,** 218–25(1922).—An address. W. A. M. (*C. A.*)

16. What progress has the new science of color brought? WILHELM OSTWALD. *Z. Elektrochem.,* **28,** 398–404(1922).—An address. H. J. C. (*C. A.*)

17. Electric heat, its generation, propagation and application to industrial processes. E. F. COLLINS. *Trans. Am. Electrochem. Soc.,* **42,** preprint(1922).—The development of elec. heat by passage of current through solid resistors, through liquid and through gaseous media is discussed at length, reference being made in particular to the fundamental theoretical principles. An efficient, com. elec. heating app. must be constructed with due regard to chem. reactions taking place, to the effect of mech. changes, such as expansion with heat, to phys. factors such as heat transmission and heat emissivity and to the comparative cost and operating factors. C. G. F. (*C. A.*)

18. Heat balances of blast furnace and steel plants. W. TRINKS. *Blast Furnace Steel Plant,* **10,** 451–6(1922).—Ideal heat balance charts are given for (1) an uneconomical steel plant, (2) an av. American plant, (3) an economical steam-operated plant, and (4) an ideally operated plant. Per lb. of finished steel produced plant (1) uses 2.25 lbs. of coal; plant (2), 1.5 lbs.; plant (3), 1.065 lbs.; plant (4) 0.89 lbs.
L. J. (*C. A.*)

19. The theory of gas producers and its application to blast furnace operations. A. KOREAVAAR. *Chimie et industrie,* **8,** 12–25(1922).—K. puts forward a theory of gas producers based partly on that of H. LeChatelier ("Le Chauffage Industriel"), partly on that of J. E. Johnson (Principles, Operation and Products of the Blast Furnace), and partly on Langmuir's theory of the reaction of a heterogeneous system (*C. A.,* **10,** 3007). He investigates the influence of the activity, size and porosity of the C and of the quantity and temp. of the air on the vol. and temp. of the zone of combustion. He applies his findings to that portion of the blast furnace which is in the immediate neighborhood of the tuyeres, and concludes that (1) the more oxidizable the coke the lower the consumption for a given temp.; (2) for a given temp. hot air requires a lower coke consumption than cold air; (3) "low coke consumption goes hand in hand with low wind," proper temp. being obtained by suitable quality of the coke and preheating of the air; (4) heating the air above a certain "critical temp." (about 800°) does not appreciably increase the temp. of the zone of combustion, and hence does not appreciably cut down coke consumption; (5) by increasing the amt. of air above a certain "critical value," the temp. is not increased, but the vol. of the zone of combustion can be increased as much as desired, within the limits of possibility. A. P.-C. (*C. A.*)

PATENTS

20. Roofing-tile kiln. TATSUJIRO KISHIMOTO. Japan 43,050, July 11, 1922. A roofing-tile kiln has three chambers which are arranged so as to form an arch. In

other words, the middle chamber is built over the passage between the other two. The waste-gases of the lower chambers are made to pass through the middle one.

S. KONDO

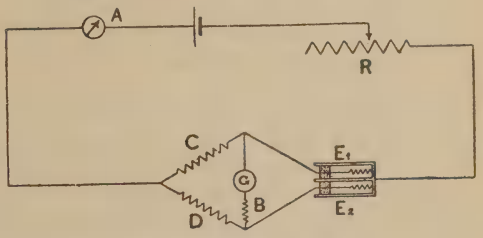
21. Electric dust precipitation. METALLBANK UND METALLURGISCHE GES. AKT.-GES. Brit. 177,117, Sept. 23, 1921. Furnace gases are cooled to the dew point or below, whereby they are de-ionized, and are heated again in such a way as to prevent ionization by flames, etc. The gases then enter an elec. precipitator, in which dry deposits are thus obtained. (*C. A.*)

22. Electrical insulating composition. L. E. BARRINGER. U. S. 1,423,985, July 25. An insulating compn. which is resistant to heat is formed of shellac, NH_4OH and Na silicate with coloring and filling materials. (*C. A.*)

Apparatus and Instruments

23. The grading of powders by elutriation. T. M. LOWRY AND L. C. MCHATTON. *J. Oil Colour Chem. Assoc.*, **5**, 82–91(1922).—Grading of powders such as Portland cements and paint pigments by sieving air and H_2O-flotation, etc. is reviewed. The most satisfactory elutriator is the single vessel form described by Boswell (Brit. Resources of Sands and Rocks Used in Glassmaking, 2nd ed. (1918)). With this app., barytes and quartz powders were fractionated by a vertical flow of H_2O at 4, 5, 6, 7, and 8 mm. per sec., and the particle diams. detd. microscopically. The grading is much more exact in a tube of 27 mm. diam. than in one of 13 mm. diam. because of the friction on the walls and the resultant gradient in the velocity of flow. The crit. diam. of the particles is about 5% greater in the narrow than in the wide tube. The crit. particle diam. decreases with rising temp. of the H_2O. The relation between diam. of grains and velocity of flow is not a linear function, nor does it obey the square or square root law as commonly stated. Under identical conditions, the diams. are 1.42 times as great for quartz as for barytes, so that sectional areas are as 2.0 : 1. This ratio is identical with the gravitational forces on the immersed particles. The lifting power of the H_2O is therefore proportional to the area of the particle. Results are tabulated and plotted. Illus. with photomicrographs. Discussion. F. A. W. (*C. A.*)

24. Electrical carbon dioxide recorders. G. A. SHAKESPEAR. *Electrician*, **89**, 543 (1922).—Most of the instruments now available for measuring CO_2 in flue gases depend on one or several chem. reactions; the chemicals have to be replenished from time to time and besides there is the disadvantage of delicate glassware in the construction. The new recorder described is a decided improvement over these older types. The underlying principle of the new type: Two identical spirals of Pt wire are enclosed in two sep. cells, E_1 and E_2 (see fig.) in a metal block. Each of the spirals is connected to one arm of a Wheatstone bridge, the other 2 arms, *C* and *D*, being of manganin. Current flowing through the bridge heats the Pt spirals and causes them to lose heat to the walls of the cells. If the compn. of the gas of one cell is different from that of the other, the thermal cond. and hence the cooling rate will be different, giving rise to difference in temp. of the 2 wires. The difference in temp. will cause a deflection of the galvanometer, the greater the temp. difference the greater the deflection. One cell is filled with air and sealed and the other is exposed to the flue gas. A filter of glass wool and Fe borings is placed ahead of the open cell to protect the Pt. Further details are given. C. G. F. (*C. A.*)



25. The sieve centrifugal. Berthold Block. *Chem. App.*, **9**, 88–91, 117–20, 141–4, 153–6, 169–71, 177–9, 189–92(1922).—A discussion, with 58 cuts, of the construction of centrifugals with mech. discharge, semi-automatic centrifugals, continuously operating centrifugals, of the proper weave of the top sieve for materials of different grain, of the proper construction of the sieve backing to prevent clogging, of the proper clothing, with references to the literature and Ger. patents. J. H. M. (*C. A.*)

26. A new type of automatic temperature regulator and its application to heat-treating furnaces. R. W. Newcomb. *Trans. Am. Soc. Steel Treating*, **3**, 28–102 (1922).—The regulator consists of 4 parts: the frame and bed plate, a $^1/_{12}$ h. p. motor with worm and worm gear speed reductions, an escapement or ratchet mechanism and a contractor. One sprocket, mounted on a ratchet wheel spindle, is connected by a sprocket chain to another sprocket wheel attached to the valve or other appliance to be regulated. When either one of the solenoids is energized one of the pawls of the escapement mechanism engages with the ratchet wheel and moves it in one direction or the other depending upon which pawl is engaged. The movement of the ratchet wheel depends upon the setting of the wrist pin at the cam. Proper selection of the sprockets can be made to correspond to open and closed valve positions. W. A. M. (*C. A.*)

27. New rotary mercury pump. L. T. Jones. *Phys. Rev.*, **18**, 332(1921).—This pump is a liquid piston pump with Hg level remaining const. The rotation of an iron drum forces air from the high vacuum side along the axis of the drum to the low vacuum side where it is removed by an auxiliary pump capable of producing a vacuum of about 1 mm. The general performance is of the same order as that of the Gaede pump. D. MacR. (*C. A.*)

28. Simplest mercury vapor pump. L. T. Jones. *Phys. Rev.*, **18**, 332(1921).—A bulb contg. about 25 cc. of Hg is heated by a Bunsen burner and the vapor rises through a nozzle into a water jacketed chamber. The air intake is situated a little below the end of the nozzle but above the lower end of the water jacket. A fore pump capable of producing a vacuum of about 0.001 mm. removes the air from the top. Pyrex glass is used. D. MacR. (*C. A.*)

PATENTS

29. Apparatus for drying thin plates or other clay articles. E. B. Ayres. U. S. 1,429,997, Sept. 26. (*C. A.*)

30. Hydrometer. C. E. Linebarger. U. S. 1,424,730, Aug. 1. Homogeneous substances of different densities are enclosed in the hydrometer tube to indicate different sp. grs. even if these substances become broken within the tube. (*C. A.*)

31. Apparatus for controlling heating of vulcanizers or other apparatus. A. Roesch. U. S. 1,430,852, Oct. 3. (*C. A.*)

32. Apparatus for controlling humidity of air. A. Roesch. U. S. 1,430,853, Oct. 3. (*C. A.*)

33. Calorimeters. Igranic Electric Co., Ltd. Brit. 183,408, April 7, 1921. In a continuous-flow gas calorimeter, the burner and associated parts are so constructed that the stream of fluid which absorbs the heat of combustion is made to flow after such heat absorption in heat-exchanging relation with the same stream before or during the absorption of heat. Further, the products of combustion are made to flow in heat-exchanging relation with the combustible mixt. so as to preheat the latter. (*C. A.*)

34. Calorimeters. Igranic Electric Co., Ltd. Brit. 183,409, April 7, 1921. In a continuous-flow gas calorimeter in which resistance thermometers are subjected to the initial and final temps. of a fluid which absorbs the heat of combustion, the thermometers are so constructed that their temp. resistance coeffs. vary in such a way that a const. relation between their resistances is maintained for a given calorific value of the gas, irrespective of the actual temp. level at which the test is carried out. The invention is

described in connection with a calorimeter of the kind described in 153,817 (*C. A.* **15,** 964), each of the thermometers contg., *e. g.*, Ni and Cu in such proportions that the desired result is obtained despite variations in the sp. heat of the heat-absorbing air and in the vapor content of the test gas, caused by variations in the temp. of the water tank contg. the wet meters supplying the gas, etc. (*C. A.*)

35. Gas-analyzing apparatus. W. D. R. Brown and W. T. Pickston. U. S. 1,422,080, July 11. The app. is adapted for automatic and continuous analysis of flue and other gases. It comprizes initial and residual gas-measuring chambers with connections such that withdrawal of the sealing liquid from the initial gas-measuring chamber by a vacuum serves to unseal the exit of the residual gas-measuring chamber. (*C. A.*)

36. Continuous centrifugal separator. Giichi Ishikawa. Japan 39,669, Aug. 23, 1921. A conical cage is used as a revolving separator, the narrow part being the top. Solid sepd. from the liquid is continuously collected in the bottom. (*C. A.*)

37. Centrifugal water separator. Hiroshi Kohama. Japan 39,671, Aug. 23, 1921. The gearing of the revolving axis and gear wheel is easily detached, so the latter is quickly stopped. (*C. A.*)

Chemistry, Physics and Geology

38. High grade clays of the eastern United States. (With notes on some Western Clays.) H. Ries and W. S. Bayley. U. S. Geological Survey, *Bull.* **708** (1922).—A survey of the worked deposits of the high grade clays, such as kaolins, ball clays, and some of the refractory bond clays. The requirements of clays for porcelain, glass house refractories, abrasives, paints, paper, linoleum, etc. are discussed. The rept. gives detailed information on the occurrence and properties of the clays found in the several sections of the U. S., and describes the methods of mining, prepn. of the clays, and information as to the size and nature of deposit, at the individual mines now producing high grade clays for the ceram. indus. This rept. of 300 pages should be of particular interest to those using Amer. clays or contemplating the substitution of these clays for those imported from Europe. R. R. Danielson

39. Copiapite. Anon. *Min. Jour.*, **135,** 852(1921).—A large deposit of copiapite (a hydrated basic sulphate of iron, rarely met with) has been located in the northeast of S. Australia. It appears to have resulted from the oxidation of marcasite, and occurs as a lode in blue slate. On ignition, the yellow copiapite yields a rich Venetian red, and a company has been formed to open up the deposit as a source of pigments and sulphur. O. P. R. O.

40. Adsorption and catalysis in fuller's earth. E. K. Rideal and Wm. Thomas. *J. Chem. Soc.*, **121,** 2119–24(1922).—Fuller's earths from Surrey, Somerset and Florida are not equally efficient in the *bleaching of edible oils*. The relations between the adsorptive and catalytic properties of these earths were examd. to obtain an explanation. The sp. surfaces were detd. to be in the ratios of 2.35, 2.13 and 1, resp. The adsorptive powers for methylene blue were in the ratios of 2.54, 2.18 and 1. The catalytic actions on H_2O_2, as measured by the reaction velocity coeffs., were 2.31, 0.58 and 2.51. Color bleaching may consist of both adsorptive and catalytic processes. The iron content of the 3 earths was possibly the governing factor in the catalysis. H. C. P. (*C. A.*)

41. Glauconite from the green sand near Lewes, Sussex; the constitution of glauconite. A. F. Hallimond. **Chemical analysis.** E. G. Radley. *Mineralog. Mag.*, **19,** 330–3(1922).—The grains, sepd. by sieving, had mean n = 1.62 and sp. gr. = 2.70. Analysis gave: SiO_2 48.12; Al_2O_3 9.16; Fe_2O_3 19.10; FeO 3.47; CaO 0.76; MgO 2.36; K_2O 7.08; Na_2O 0.22; H_2O (105°) 4.78; H_2O>105° 5.28%. In order to det. the constitution of the mineral many analyses were recalcd. in mol. proportions.

The proportion of alkalies was found to be quite const. and no evidence of the substitution of these by H_2O or by the magnesia group was detected. There is considerable replacement of the K_2O by Na_2O. In the groups R_2O_3 and RO the mol. proportions are not constant and indicate no relationship to the silica and alkalies. If the (Fe, Mg)O and (Fe, Al)$_2O_3$ are considered as mutually replaceable, the ratios obtained lead to the formula, $R_2O.4(R_2O_3, RO).10SiO_2.nH_2O$, the ratio of bases to silica being 1:2.

W. F. H. (*C. A.*)

42. The plastometer as an instrument for process control. E. C. Bingham, H. D. Bruce and M. O. Wolbach, Jr. *J. Ind. Eng. Chem.*, **14,** 1014-5(1922).—Amorphous materials often lack definite characteristics, melting point, soly., and fluidity. The authors suggest the use of (1) the yield value, (2) the mobility, (3) the concn. of zero mobility—connected with the pore space, (4) the concn. of zero yield value—connected with particle size, and (5) the temp. at which the yield value becomes zero—analogous to the melting point. The authors also distinguish between plastic and pseudo-plastic materials. E. C. B. (*C. A.*)

43. Light metal alloys for p'stons. W. D. Williams. *Raw Material,* **5,** 259–66 (1922).—The disadvantages and advantages of *Al alloys* over steel and cast Fe are discussed. The difficulties encountered in the manuf. of Al alloys and their subsequent treatment for use as pistons, together with a discussion as to how to overcome these difficulties, are considered. Al alloys are also used in the manuf. of cylinders for power cars. The prospects for the new Mg alloys, which in many cases are preferred to the Al alloys, depends mainly on the soln. of the question of cost and of production in sufficient quantities. V. O. H. (*C. A.*)

44. The forms of gas and liquid cavities in gels, and their interpretation by surface compression. A. W. C. Menzies and R. Bebbe. *Science,* **55,** 75–6(1922).—With gelatin and silica gels in air-satd. media, controllable *bubbles* are produced by rise of temp. and reduction of air pressure. The phenomena permit of an interpretation from the point of view of *surface compression* rather than of surface tension. In a gel, space occupied by a bubble which has been caused to diminish becomes filled with liquid. This phenomenon has not before been described. These cavities are of two forms. (1) Derived from gas cavities of oblate spheroidal form they take the shape of bivalve molluscs, the "shells" being shaped like segments of spheres, bowls, etc. While the sphere is the stable form enveloped by a membrane under surface tension, this is not the case if the membrane is under surface compression. The membrane is thus thrust out at surfaces of smallest radius of curvature, giving rise to the forms observed. (2) Derived from cavities of prolate spheroidal form they take the form of a solid of three lunes, having one axis of triad symmetry perpendicular to one plane of symmetry. The three segments of the surface are of "orange peel" shape. "It is believed that the forms here described and interpreted are unique in organic nature." H. W. B. (*C. A.*)

45. The theory of the formation of dolomite. R. Ballo and L. Jugovics. *Foldtani Közlöny,* **45,** 221–33 (Hungarian), 286–92 (French) (1915); *Mineralog. Abstracts,* **1,** 317.—Expts. were made on the action of H_2S, NH_4, and SiO_2 (as an alk. silicate soln.) on the system $CaCl_2 + MgCl_2 + Na_2CO_3 + NaCl + H_2O$ at 18–20° and normal pressure. These show that under those conditions dolomite is not formed. Crystals of artificial *nesquehonite* are described with $n = 1.4745 - 1.557$. E. F. H. (*C. A.*)

46. An investigation of the electrical properties of silica acid sols. Otto Lösenbeck. *Kolloidchem. Beihefte,* **16,** 27–46(1922).—The addn. of silicic acid sol decreased the cond. of solns. of HCl, at first rapidly and then always less, according to an *e*-function. The curve finally approached asymptotically the limiting value. The migration velocity of SiO_2 particles was detd. experimentally and substituted in Smoluchowski's equation in order to calc. the contact potential. This equation (cf. *Krak. Anz,* **1903,** 182) is $U =$

$Vk/4\pi\eta$, in which U is the migration velocity for a field strength of 1 E. S. unit, V is the p. d. of the double layer in E. S. units, k is the dielec. const. for H_2O and η is the viscosity of H_2O in C. G. S. units. As shown by cataphoresis, the SiO_2 particles were negatively charged. This negative charge decreased with each addn. of HCl to zero at the isoelec. point and finally the particles assumed a positive charge greater than the negative charge for the acid-free sol. The behavior of the SiO_2 particles was not uniform. Measurements for different concns. of the same sol showed the contact potential to be dependent on the concn. To explain the observed facts the suggestion is made that the SiO_2 particles absorb the HCl like a sponge. H. M. McL. (*C. A.*)

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47. Process of giving form to fuller's earth. Kikunae Ikeda, Hajime Isobe and Tsuruji Okazawa. Japan 42,368, April 20 (1922). Short rough-surfaced cords or threads are made by pressing a mass which has been prepared by kneading a mixture of fuller's earth or Florida earth and 80–110% of water through a small opening. They are then heated at 150–600°C. These cords or threads are used for drying air.

S. Kondo

48. Treating clay. W. Feldenheimer and W. W. Plowman. Brit. 184,271, May 9, 1921. A process for the treatment of clay comprizes deflocculation of the clay in an aq. medium by means of a dil. soln. of HPO_3 or the metaphosphate of an alkali either alone or in conjunction with an alkali such as Na_2CO_3. The proportion of deflocculator may be varied according to the hardness of the H_2O used. The clay may be subsequently recovered from its suspension in any desired manner. When flocculation is adopted an aq. soln. of alum, or $NaHCO_3$ may be used as a flocculator, in the manner described in 121,191. Cf. *Ceram. Abs.*, **1** [10], 251. (*C. A.*)

49. Refining clay. Plauson's (Parent Co.), Ltd. Brit. 184,880, May 21, 1921. Pure kaolin is prepd. by sepn. of SiO_2 and other silicates by intensive mechanical disintegration at a peripheral speed of over 1000 m. per min., preferably in the colloid mill described in 155,836, with H_2O and with or without a dispersator, the kaolin being selectively colloidalized. Suitable dispersators are water-glass, tanning agents, humus and humic acids or their compds., saponin and other soap-like froth-forming substances or sol. silicates, aluminates, ferrocyanides, thiocyanates and borates. The resulting dispersion may be concd. by ultra-filter presses. The colloidal clay may be used in the manuf. of colloidal inks, as a filler in rubber mixings, etc. Cf. 3592, **1880.** (*C. A.*)

50. Drying clay. T. Rigby. Brit. 183,535, April 16, 1921. Pastes of china or like clay such as are dug from the ordinary settling pits are dried by being spread as films upon heated surfaces in app. such as that described in 149,055, in which the surfaces are heated by the vapors evolved from the film, after compression, or in the multiple-effect app. described in 180,963, and 181,035. A suitable construction is specified. (*C. A.*)

51. Porcelain. British-Houston Co., Ltd. Brit. 184,090, Sept. 27, 1921. A ceramic material particularly suitable for elec. insulation is obtained by firing a mixt. contg. 5–35% of beryl in addition to the usual ingredients, such as clay, silica, and feldspar. (*C. A.*)

Refractories and Furnaces

52. Materials for furnaces and ovens. E. F. Collins. *Chem. and Met. Eng.*, **28**, 79(1923).—An abstract of a paper by E. F. Collins, on "Electric Heat, Its Generation and Application to Industrial Processes," presented before the Amer. Electrochem. Soc. Charts and tables are reproduced showing the limitations of various metals and ceramic products for furnaces, particularly elec. heated equipment. One chart shows the thermal resistance of heat insulators, refractories, and heat conductors.

R. R. Danielson

53. Electric furnaces produce quality steel. J. A. MATHEWS. *Elec. World*, **80**, 1086, 1088, 1091(1922); 6 illus.—The reasons for the world-wide expansion of elec. steel making are (1) cheapening of wholesale power rates, (2) extreme flexibility and adaptability of furnace, and (3) superior quality of product. For installed elec. furnace capacity, Italy now ranks ahead of Germany, England and France, and second only to the U. S. C. G. F. (*C. A.*)

54. Refractories for electric furnaces. W. J. REES. *Foundry Trade J.*, **23**, 66–7 (1921); *J. Inst. Metals*, **27**, 525.—The desirable properties of a dependable refractory for an elec. furnace lining are: (1) high m. p. and strength at high temp.; (2) uniformity of vol.; (3) high resistance to abrupt temp. changes; (4) high resistance to slag and metal attack; (5) high resistance to abrasion of hot gases; (6) low elec. cond.; (7) low sp. heat. H. G. (*C. A.*)

55. Electric furnaces for the melting of steel. K. P. GRIGOROVITCH. *Rev. metal.*, **19**, Abs. Sec., 412–13(1922).—A review of the resistance (Hoskins), the induction (Rodenhauser), and the arc (Rennerfeld and Heroult) types of elec. furnaces and their industrial applications. W. A. MUDGE (*C. A.*)

56. A study of refractories. W. A. HULL. *The Ceramist*, **2** [3], 205(1922).—General discussion of the properties, uses and a résumé of the work which has been done by the Bureau of Standards on refractory clays and refractories. The author concludes that no important advance has been made in the writing of specifications for refractories since 1911. C. W. PARMELEE

57. Determination of the softening temperature of refractory materials under load. W. STEGER. *Ber. deuts. keram. Ges.*, **3**, 1–4(1922)—The test-piece, in the form of a small cylinder, is supported on a refractory cylinder of electrode C, 6 cm. diam., and heated in a vertical cylindrical elec. resistance furnace 8 cm. diam., internally, with an e. m. f. of 100–120 v. A second (hollow) C cylinder stands on the test-piece and is provided at its upper end with a plate to which the pressure from a scale-pan carrying weights of 20–100 kg. is transmitted through a simple system of levers. The small movement of the last lever in the series is marked on a rotating drum by means of a light index, about 1 m. in length, which magnifies it 20 times. The hollow C cylinder enables the top of the test-piece to be inspected and its temp. to be measured by an optical pyrometer or a thermoelectric couple. J. S. C. I.

58. Electric furnace melting. C. A. BIRD. *Chem. Met. Eng.*, **26**, 870–1(1922).—Advance in elec. furnace applications might be hastened by attention to progress in refractories, elimination of inherently poor designs, and by seeing that competent operators are in charge of all furnaces supplied. L. J.

59. Some developments in insulating materials and processes in Great Britain. A. P. M. FLEMING. *India Rubber J.*, **64**, 641–4(1922).—Life tests of insulating materials under lab. conditions have heretofore given results not conforming well with results under practical service conditions over extensive periods. New procedures are suggested in 2 directions: (1) the use of higher temp. limits whenever safe and (2) a comparison of machine performance on a basis of temp. rise in place of a basis of total temp. as recommended by the International Electrotech. Commission. Particulars are given of the facilities established for research, with a discussion of important developments in insulating materials and processes used in various types of elec. app., with special reference to thermal considerations. C. C D. (*C. A.*)

60. Report on the Manchurian magnesite. KOSUKE HIRANO. *J. Jap. Cer. Assoc.*, **361**, 414–23(1922).—Color, appearance, sp. gr., chem. compn. and burning behaviors of 102 specimens of magnesites which were collected from all mine-lots possessed by the South-Manchurian R. R. Co. except the Mt. Kamba and the Mt. Gyushin whose magnesites were reported by the author in the April of 1919, are described in

details. The range of sp. gr. is 2.76–3.01. They have following compns.: 0.20–30.28% silica, 0–1.80% alumina, 0.18–4.37% ferric oxide, 0–24.12% lime, 16.32–47.02% magnesia and 36.20–51.78% loss on ignition. S. KONDO

PATENTS

61. Fused zirconium oxide articles. A. L. DUVAL D'ADRIAN. U. S. 1,430,724, Oct. 3. ZrO_2 is finely ground, mixed with a binder such as starch or molasses and molded into tubes, blocks, crucibles or other articles, heated to dull redness between C electrodes and then heated by resistance to above 2500° to fuse the particles together. (*C. A.*)

62. Crucibles. M. BOÏBOUL. Brit. 179,928, May 5, 1922. Addition to 165,051. Crucibles for fusing refractory minerals are composed of a mixt. of the oxides of Zr, Y, Th and Er, suitable proportions being Zr oxide 60–80%, Y oxide 13–17%. Th oxide up to 10%, and Er oxide 5–20%. The Th oxide may be omitted. Rare earths, such as Ce oxide, may be added to the foregoing ingredients in proportions up to 20%. Ce oxide or Be oxide may be substituted for the Er oxide. (*C. A.*)

63. Refractory oxychloride cement. G. S. PEASE. U. S. 1,429,451, Sept. 19. A fire-resistant compn. adapted for molding into slabs is formed of a cellular mass of oxychloride cement the cells of which are filled with charred cork or other poor conductor of heat. (*C. A.*)

64. Electric furnace adapted for heating crucibles for metal or ceramic articles. I. RENNERFELT. U. S. 1,431,424, Oct. 10. The furnace has a central hearth on which a mass of comminuted graphite is placed and a ring-shaped hearth adapted for rotation about the central hearth. An electrode projects downward from the furnace roof into close proximity to the material on the central hearth. Cf. *Ceram. Abs.*, **2** [2], 20(1923). (*C. A.*)

65. Electric induction furnace for heat-treating or melting metals. W. ROHN. U. S. 1,431,686, Oct. 10. (*C. A.*)

66. Refractory composition. C. A. WHITE. Can. 225,123, Oct. 24, 1922. A non-recrystd. refractory material contains SiC, cryst. graphite and a carbonizing binder. A flux such as borax or sand and borax may be used to form a protective coating around the particles of the composition. (*C. A.*)

67. Refractory composition. C. A. WHITE. Can. 225,124, Oct. 24, 1922. A refractory material contains a chemically inert refractory material, cryst. graphite and a carbonizing binder such as tar or pitch. A flux such as borax or sand and borax may also be used to form a protective coating for the particles of the material. (*C. A.*)

68. Refractories. DENIS LOUIS. Can. 225,725, Nov. 7, 1922. A porous refractory material contains 30 parts of pure rich refractory earth contg. 70–80% sand, 30 parts MgO, 25 parts light earth contg. 80% sand and 5 parts sawdust. (*C. A.*)

69. Refractory material for zinc retorts. W. F. ROSSMAN. U. S. 1,424,120, July 25. A refractory material for manuf. of retorts is formed of plastic clay, finely pulverized SiO_2 and ground grog about equal in amt. to the SiO_2. (*C. A.*)

70. Gas-fired pottery kiln. A. M. DUCKHAM. U. S. 1,423,408, July 18. (*C. A.*)

71. Silica brick. O. REBUFFAT. U. S. 1,420,284, June 20. Silica brick of very nearly const. vol. and of a d. of 2.27–2.30 is prepd. by adding a phosphate, *e. g.*, Ca phosphate, contg. P_2O_5 to the amt. of 0.45% of the SiO_2 used, and heating to 1300–1350° for 8 hrs. to transform quartz into allotropic forms of SiO_2 of lower d. (*C. A.*)

72. Electrical resistance material. F. EICHENBERGER. U. S. 1,420,980, June 27. A paste is formed of finely divided Si carbide, $CaCO_3$, Fe oxide and graphite, molded and embedded in sand and burned out of contact with air. (*C. A.*)

73. Insulating cement. A. S. ELSENBAST and W. L. JORDAN. U. S. 1,421,192, June 27. A heat insulating cement adapted for covering walls is formed of diatomaceous earth 80, clay 10 and starch 10%. (*C. A.*)

Abrasives

74. Artificial corundum. H. A. RICHMOND and R. MACDONALD. Can. 220,855, July 11, 1922. An abrasive material contg. less than 0.6% Ti, 0.5–2% SiO_2 and 0.3–2% FeO is produced by melting impure Al_2O_3 substantially free from TiO_2 in the presence of Fe and reducing part of the SiO_2 and FeO without materially reducing the TiO_2, then allowing the mass to cool slowly. See *Ceram. Abs.*, **1** [10], 255(1922).

75. Alumina from low-grade bauxite or clays. R. S. SHERWIN. U. S. 1,422,004, July 4. A sintered unfused alumina, silica-lime-soda mixt. obtained from bauxite or clay, lime and Na_2CO_3, NaOH or NaCl is leached to dissolve Na aluminate; this soln. is heated under pressure to ppt. SiO_2 and alumina is recovered from it. (*C. A.*)

Stoneware, Whiteware and Porcelain

76. The unique development of modern chemical stoneware. PERCY C. KINGSBURY. *Chem. and Met. Eng.*, **27**, 1226(1922).—An acct. of the progress made during recent years in the manuf. and use of chem. stoneware. The type of clay, its prepn., and treatment of the ware during manuf. are described. The phys. and chem. properties of this type of ware are given. The writer discusses the extending uses and the probable future of this interesting and useful product. R. R. DANIELSON

77. The white clay industry in the vicinity of Langley, S. C. W. M. WEIGEL. U. S. Bureau of Mines, Serial No. 2382. The methods of mining and preparing white clays for market in this vicinity are described. Analyses of representative clays (sedimentary kaolins) are given. The clays are well adapted for use in paper stock, for which they are mainly used, and in pottery and china ware, without washing. R. R. D.

78. Pottery making in the Blue Nile. H. A. MACMICHAEL. *Sudan Notes and Records*, April–July(1922).—The manuf. of vessels which he describes are the "Burma" or pots for carrying and storing water; and the water-jars used for the "Sagias" or water-wheels. The implements used are a roughly smoothed lump of stone the size and shape of a penny bun, and an oblong, slightly concave, river shell, which, if unprocurable, can be replaced by a fragment of dry water-melon husk. With these the lump of clay is kneaded with donkey's dung; is beaten into shape, and smoothed. The industry of making the "Sagia" jars is not originally found in Sudan; but is rather Nubian and Riverian. O. P. R. O.

79. Standardization of filter presses. ANON. *J. Soc. Chem. Ind.*, **41**, 210–11R (1922).—Revision of the preliminary report of the joint committee of the Brit. Chem. Manufacturers and Chem. Plant Manufacturers Assocs. A standard design of 48 in. chamber press and 48 in. plate and frame press has been added, with feed in an external central top lug, and wash outlet cocks on upper corners. Dimensions of rubber joint rings (grommets) and grooves are standardized. Minor changes are made in the rim of all plates, the rim of center feed channel for chamber presses, and dimensions of passages. Standard identification marks are suggested. W. L. B. (*C. A.*)

80. Note on the cause of the "splitting" of a pottery body. M. B. CRAVEN. *J. Soc. Chem. Ind.*, **41**, 329–30T(1922).—In making ring supports for incandescent gas mantles trouble was encountered in splitting or splintering off. English bodies were compared with a satisfactory Germany product. Chem. analyses were about the same. The German rings showed no large content of MgO although they were sold under the name "Magnesia." Porosities were about the same—10–13%. Sections examd. under a magnification × 30 showed the marked superiority of the German ware, fine grained, homogeneous and free from laminations or cracks, in contrast with irregular grains, imperfect cohesion and striations in the English rings. The German body analyzed SiO_2 66.25, Al_2O_3 31.93, Fe_2O_3 0.72, P_2O_5 1.03, CaO 0.03, MgO 0.70, ign. loss 0.22%, alk. very low. C. H. K. (*C. A.*)

81. Modern handling methods in the manufacture of electrical porcelain. G. L. MONTGOMERY. *Chem. Met. Eng.*, **27**, 59–62(1922).—The porcelain plant of the Square D Co., Peru, Ind. is described. The complete handling system is described. Hand lift trucks, belt conveyors and gravity conveyors are used. Cf. *Ceram. Abs.*, **2** [1, 2], 56.
C. H. K. (*C. A.*)

PATENTS

82. Process of manufacturing ignition-plug and other refractory porcelains. SHINTARO NIIMURA. Japan 41,540, Jan. 27, 1922. Ignition-plugs, porcelain crucibles and evapg. dishes are formed by casting slips which have previously been kept at reduced pressure by means of a vacuum pump to drive off the air or other gases contd. in them. The slips may, at the same time, be heated or boiled, under constant stirring or not.
S. KONDO

83. Process of manufacturing heat-insulating wares. SHINSAKU NAGASAKI. Japan 41,666, Feb. 6, 1922. Stoves, small portable furnaces and similar vessels are formed with a stiff-plastic body which has been prepd. by mixing suitable amounts of clay and slaked lime to powder or fine grains of coal-cinder. They are fired in a Japanese roofing-tile kiln.
S. KONDO

84. Method of making wares of stones. YUICHI SHINAGAWA AND SEIZABURO YOSHIZAKA. Japan 43,361, Aug. 29, 1922. Engraved wares of stone are heated, in the access of air and flame, after they have been coated with an oil. The treatment makes their texture more distinct or changes their color, and increases their hardness.
S. KONDO

85. Ceramic compositions. L. A. CORDENOT. Brit. 177,160, March 14, 1922. Grains of natural or artificial corundum, or composite artificial aluminates melted in the elec. furnace are incorporated in ceramic compns. (*C. A.*)

86. Porcelain. F. H. RIDDLE. Brit. 177,553, Sept. 23, 1920. Clay is mixed with an alk. flux and sillimanite or materials adapted to interact to form sillimanite and the mixt. is fired so as to produce sillimanite and a glassy matrix in which practically all the free silica is dissolved. The clay may be kaolin with or without an admixt. of ball clay. The flux may be previously prepd. by firing a mixt. of alk.-earth oxides, introduced as talc, magnesite, whiting, dolomite or the like, and clay, with or without flint. Alternatively these ingredients may be mixed with kaolin and alumina, which react to produce sillimanite, and the operation carried out in one stage. Final product preferably contains 60–85% of sillimanite and 1.5–3.0% of alk. earths. Examples of proportions are given. (*C. A.*)

87. Porcelain. C. C. TREISCHEL. Can. 220,737, July 11, 1922. An elec. insulating material consists of a fired mixt. of clay 219, SiO_2 35, feldspar 144 and beryl 130 parts. (*C. A.*)

Art and Design

PATENT

88. Process of under-glaze coloring. DAIGORO FUKUOKA. Japan 43,176, July 31, 1922. Numerous shots of clay or other substances are soaked in wax which has or has not been mixed with pigment, are filled in a vessel so as to embed pottery body in them. By warming the whole vessel, the wax adheres to the surface of the body. The body may then be covered with a net which has previously been soaked in wax, colored with pigment or not, and warmed again. Then the body is painted with underglaze color and fired in a kiln.
S. KONDO

Heavy Clay Products

89. On the absorption-test of common brick. SEIJI KONDO AND MASARU NAKAO *J. Jap. Cer. Assoc.*, **363**, 527–51(1922).—Elaborate experiments on the methods of

testing water absorption of common bricks have been worked for the National Committee on Industrial Standards. Proposed method for absorption-test. The test bricks shall first be weighed and then dried in an air bath at a temperature of 125° to 135°C for 2 hrs. After removing from the drier they shall be reweighed at once. If the second weight closely checks the first they shall be considered dry, but if it does not check the latter they shall be replaced in the drier and dried an additional 2 hrs. If the third wt. checks the second they are considered dry. In the case of doubt the bricks should be subjected to further 2-hr. drying treatments until check wts. are obtained. After the dry wt. is obtained, the bricks shall be cooled to room temp. and laid flat in a vessel. The bricks shall then be submerged in water which is one cm. deep, and the water-level shall be kept constant for 24 hrs. Then more water shall be added to the vessel so as to immerse the bricks entirely in it, their upper surfaces being 3 cm. below the water-level. Keep it for further 24 hrs. Then the brick shall be reweighed after surplus water has quickly been wiped from their surfaces with a wet cloth which has been wrung hard. All weighings shall be read to the nearest gram. S. KONDO

90. Burning roofing tile. ANON. *Brit. Clayworker*, **30**, 279–80(1922).—Tile burned in continuous kilns of suitable design are equally as good as those fired in periodic kilns and only $^1/_3$ to $^1/_2$ of the fuel is used to fire continuous kilns as compared with periodic kilns. Firms who have used continuous kilns for roofing tile may be divided into 3 groups as follows: (1) Those who have found continuous kilns satisfactory, (2) Those who have failed to get good results, and (3) Those who get good results at times but not sufficient to satisfy them. The two last groups may be divided into those whose clay is unsuitable for use in continuous kilns and those who obtain good results except for a kiln of unsuitable design. In most cases where the continuous kiln has been properly tried and found to be a failure, the fault is due to using too short a kiln, *i. e.*, one with too few chambers. Tile are more tender than brick and must be fired slower. The following schedule is employed for burning: smoking 3 days, preheating 5 days, full fire 3 days, cooling 5 days, and setting and drawing 2 days. In order to get an output of one chamber per day, it would require 18 chambers and if an additional day is devoted to preheating and another to cooling it will require a 20 chamber kiln. A chamber 14 ft. square and 8 ft. 6 ins. high will hold 4000 bricks and about 16,000 tile. Actually much narrower chambers are used, some being only 7 ft. wide so that the normal output is only 2000 brick and 3000 tile per day. By using a kiln twice the usual length it is possible to increase the rate of fire travel in the same proportion. This is done in Bührer's kiln with excellent results. Continuous kilns of the down-draft type appear to be excellent in every way for roofing tile. They are more costly to build than the simpler continuous kilns but are under better control and provide a more uniform heat. There are a good many continuous kilns which are unsuitable for roofing tile and there are also some clays which are more difficult to fire in continuous kilns than others.

H. G. SCHURECHT

91. Brick for forges and annealing furnaces. ANON. *Brit. Clayworker*, **31**, 154–5(1922).—Brick for the sides and top should be resistant to spalling while those on the bottom should be resistant to slagging action. The most suitable brick are grog fire brick. Silica brick fail because they are not resistant to spalling while special refractories are too expensive. Since these furnaces are only heated to a bright red heat No. 2 fire brick are amply refractory. The roof and sides should be built of coarse textured porous brick and must be well burned to a constant volume. Hand-made fire brick are generally preferred to those pressed in machines as the latter are usually denser and consequently not so resistant to sudden temp. changes as the hand made brick. The hearths of furnaces are very variable in temp. which is liable to change suddenly, so that resistance to sudden temp. changes is of prime importance. Resis-

tance to abrasion from the iron to be heated and corrosion from the scale and fuel are equally important. The fire brick for the hearth should therefore be fine in texture, rather dense on the surface with a porous interior. Even for the hearth it is seldom necessary to use fire brick of high refractoriness, strength being a more important property. Machine-made fire brick are quite satisfactory for the hearths of forges as they have a close-textured surface resistant to slags, while their interior is porous. H. G. S.

92. The occurrence of vanadium in ceramic raw materials and ware and its effect upon the fusibility as well as the color and formation of scum on a pure kaolin and a brick clay. O. KALLAUNER AND I. HRUDA. *Sprech.*, **45**, 333–5, 345–9(1922).—A large number of minerals contain V in small amts. and among these are clay. Seger pointed out that KVO_3 often causes a scumming and yellow discoloration on brick clays. A study was made of the effect of V_2O_5 on the fusion of clays, on the discoloration of clays and scumming. It was found that V_2O_5 in small amts. does not affect the fusibility of kaolin but in larger amts. acts as a strong flux as is shown below:

Kaolin	100	99	95	90	80	60	40	20	0
V_2O_5	0	1	5	10	20	40	60	80	100
Fusion cone	35	34	33	32	30	15	5a	08a	675°C

The V_2O_5 causes a yellow discoloration when present in quantities as low as 0.1%. This discoloration may be partly reduced by the addn. of $BaCO_3$ or $Ba(NO_3)_2$. As low as 0.001% V_2O_5 may cause scumming in a clay. This scumming may be reduced by firing with a reducing kiln atmos. and by the addn. of Ba or Ca compds. as is shown below. All tests were made on a mixt. of 99% kaolin and 1% V_2O_5 and the amt. of sol. V_2O_5 which is given below in mgs. after the diff. treatments was used to compare the diff. treatments

	No treatment	2 equivs. 5% $BaCO_3$	2 equivs. 5% $CaCO_3$	2 equivs. 5% $PbCO_3$	2 equivs. 5% $MnCO_3$	2 equivs. 5% $BaCO_3$	1 equiv. $Ba(NO_3)_2$
Dry	0.591	.....	0.542	0.219	0.443	0.223	0.034
OXID.							
500°C	0.243	0.025	0.490	0.132	0.204	0.024	0.048
700°C	0.021	0.098	0.141	0.014	0.021	0.023	0.036
900°C	0.076	0.115	0.258	0.049	0.103	0.051	0.055
1100°C	0.095	0.080	0.063	0.022	0.084	0.013	0.058
REDUC.							
500°C	0.143	0.012	0.400	0.023	0.199	0.024	0.048
700°C	0.046	0.026	0.068	0.029	0.116	0.026	0.029
900°C	0.048	0.006	0.035	0.016	0.064	0.021	0.020
1100°C	0.078	0.069	0.060	0.009	0.017	0.016	0.066

H. G. SCHURECHT

PATENTS

93. Process of manufacturing rough-surfaced architectural pottery. ICHIRO YOKOI. Japan 43,328, Aug. 23, 1922. Green bodies made of feldspar, granite and bog iron ore are put in a sagger, leaving small spaces between them. The sagger is then filled with powder of calcined quartz. By firing it to a temp., a little below the m. p. of the body, mottled wares with rough surface are obtained. S. KONDO

94. Prevention of efflorescence on bricks, etc. E. C. DE MEJER. Brit. 177,990, March 31, 1921. A compn. applied with a brush to brick, mortar, and plaster walls to prevent efflorescence consists of a mixt. of 1 cwt. of Burgundy pitch and 9 gal. of turpentine contg. in soln. 36 oz. beeswax or other wax. Half of the turpentine is added to the melted pitch at a temp. of 290–300°F, and the remainder after cooling to 100°F, or lower. (*C. A.*)

Glass

95. Study of glass. (Report No. 3.) KIYOHIKO HAGIWARA, KAN-ICHI MORIMOTO, KIYOSHI UEDA AND TAITARO HIRAOKA. *J. Jap. Ceram. Assoc.*, **362,** 457–488(1922).—This paper is a continuation of the Report No. 1, in which the authors attributed the cause of dimness of mirrors to minute spots on the surface of glass. (1) *Exudation at high temps.*—When a piece of window-glass was heated to 350–600°C for 1–2 hours in an elec. furnace, it was covered with minute particles which increased in amt. with the time of heating. They grew rapidly at 650° and disappeared almost completely when it was heated at temps. over 800°. It was observed that their amts. diminish in repeating the process, if they are wiped out every time, and also that their growth ceases completely or nearly so after the minute particles have once been erased with a piece of wood or steel. (2) *Exudation at ordinary temps.*—Similar minute particles appear also at ordinary temp., though it requires much longer time, usually more than 3 days. They must not be confused with the products of weathering. They grow uniformly scattered, in dendritic crystals or groups, the latter two aggregates being probably caused by the atm. moisture. (3) *The nature of the exuded substance.*—The substances, exuded at ordinary or higher temps., are hygroscopic and form hydrated crystals which sustain efflorescence as days pass. Microscopic examns. of these substances before and after treating with hydrochloric acid or calcium chloride, indicate that they are mainly sodium silicate, sometimes containing sodium sulphate. (4) *Amt. of the exudation.*—The amts. of the substances, exuded from window-glass when new specimens were heated at 480–520°C in a muffle-kiln for 1, 5 and 10 days, were 0.0035%, 0.0052% and 0.0088% of glass respectively. (5) *Exudation on the surface of glass-cylinders.*—Experience in the cylinder-process of mfg. window-glass tells us that the drawn cylinder is sometimes covered with minute particles, though it happens only rarely. Some cylinders which broke in drawing have shown striped growth of the particles which is more common with window-glass made by Fourcault's or Colburn's process. Such a glass is very brittle and breaks usually in leer. The authors believe that the minute particles are exuded from glass owing to its unstable state of equilibrium. (6) *Exudation in pores.*—Some pores in glass have much exudation while others show it only after heating at a temp. over 400°. (7) *Glass-mirrors.*—Glass for good mirrors must be polished to remove the exudation baked on its surface or has to be examd. with vitroscope before it is silvered.

S. KONDO

96. Coloring glass with nickel. KITSUZO FUHA. *J. Jap. Cer. Assoc.*, **361,** 430 (1922).—Numerous batches were melted to find the coloring action of nickel and its compds. on various glasses with or without addition of oxidising or reducing agent. Conclusions are: (1) Nickel oxide gives purple to potash glasses and gloomy brown to soda glasses, though these effects become less distinct as the amount of nickel oxide increases; (2) The difference in the bivalent metal of a glass-formula does not affect the color materially except barium which has peculiar effect on the color produced by nickel oxide; (3) In boro-silicate glasses, nickel oxide produces pinkish purple; (4) Metallic nickel or nickel carbonate may be used instead of nickel oxide; (5) The presence of oxidising agent (potassium nitrate), reducing agent (potassium tartrate) or arsenious acid in batches does not affect the color given by nickel oxide.

S. KONDO

97. Glass industry. W. E. S. TURNER. *Chem. Trade Jour. & Chem. Eng.*, **71,** 707(1922).—At a recent meeting of the Soc. of Glass Tech. at Sheffield University, Prof. Turner gave a short acct. of his visit to Czecho-Slovakia to investigate the position of the glass indus. He states that the indus. on the continent has not made anything like the strides it has in Eng. The Bohemian glass industry is living largely on its traditions and machinery for mfg. scarcely exists, the work being carried on largely

by hand as it was before the War. As a result Eng. in many methods, from a technical point of view, leads the European continent. O. P. R. O.

98. Clouding of table-working glass tubing in the blowpipe flame. M. W. TRAVERS. *J. Soc. Glass Tech.*, **5**, 61–70(1921).—In articles made in the blowpipe flame from glass tubing a faint opalescent ring occasionally appears immediately adjacent to the glass actually melted. The effect was only obtained with coal gas when O was in excess, and in the oxy-hydrogen flame when S compds. were introduced. The amt. of clouding varies with the time of heating. A glass jet heated externally by a H flame and conveying a current of SO_2 clouded internally on cooling. From Nernst's equation T. calcs. the dissoc. pressure, in atms., of the gases CO_2, SO_2, and SO_3 in contact with the solid phases Na_2CO_3, Na_2SO_3, and Na_2SO_4 to be $P_{SO_2} = 40$, $P_{SO_2} = 3.0$, $P_{SO_3} = 10^{-9}$ at 700°, and with the liquid phase, glass, present the values will be raised somewhat. Hence CO_2 will not attack glass, and SO_2 at 1 atm. pressure will only attack at a temp. some distance below the softening point. As, however, the SO_2 content of the burned gases at the edge of the flame varies from 2×10^{-5} atm. upwards, if at 700° only 0.01% of this were converted into SO_3, the pressure of the latter would be 2×10^{-9}. Thus it appears probable that there is, within the variation of the limits of the S content of town gas, an amt. which, if exceeded, would cause sufficient pressure of SO_3 at the edge of the flame to give solid Na sulfate (or less probably silica). J. S. C. I.

99. Heat balance of a plant consisting of an air-steam blown gas producer and a glass tank furnace. M. W. TRAVERS. *J. Soc. Glass Tech.*, **5**, 166–83(1921).—A detailed analysis of the combustion and melting processes, with consideration of heat losses, gave the following data: In a tank working at 1400°, with regenerators for preheating gas and air to 600°, there would be a fuel efficiency of 35% (the remaining 65% being lost outside the furnace), while, of this energy, 26% would be lost through the furnace walls, and 9% only would be used in melting glass. The coal consumption per ton of glass would be 0.94 ton. In a similar tank where gas and air were preheated at 800° the fuel efficiency would be 45%, of which 12% would be used for melting glass, and 0.73 ton of coal would be used per ton of glass. Finally with air and gas preheated to 1000° the fuel efficiency would be 55% (44.5% used for melting glass), the coal consumption per ton of glass being 0.60 ton. J. S. C. I.

100. A study of brown glass milk bottles. A. W. BITTING. *Glass Industry*, **3**, 157(1922).—It was found that when milk was exposed to the sun simultaneously in brown and clear bottles that the contents of the brown bottles were heated from 3° to 5° higher. The quantity of bacteria and acidity was increased so that the milk soured much more quickly in the brown bottles. The bacterial increase and change in compn. seemed to be more marked than could be accounted for by the difference in temp. alone. Clear glass evidently permits the strong light to exercize some inhibiting effect on the organisms while the brown has a less restraining influence. Milk when exposed to a strong light may acquire a tallowy taste, and sometimes a rich looking milk will take on a dead or chalky appearance. On these two points the amber bottle showed an advantage over the clear glass. J. B. P. (*C. A.*)

101. Heat balance for a 25-ton glass tank. F. J. DENK. *Glass Industry*, **3**, 109–11, 135–7, 151–3(1922). J. B. P. (*C. A.*)

102. Solubility and decomposition in complex systems (glass and ceramic ware). G. W. MOREY. *J. Soc. Glass Tech.*, **6**, 20–30(1922).—M. discusses first the 3-component triangular diagram H_2O–K_2O–Cr_2O_3, points on the side of the triangle representing binary mixts. and points inside ternary mixts. (cf. Schreinemakers, *Z. physik. Chem.*, **55**, 71(1906)). The diagram may be used to differentiate between compds. sol. in H_2O, *e. g.*, $K_2Cr_2O_7$ and those decomposed by it, *e. g.*, $K_2Cr_3O_{10}$. A similar diagram for H_2O–

K_2O–SiO_2 at various temps. up to 1000° was then studied. It is stated that the first action of H_2O at ordinary or moderate temps. on glass or ceramic ware is one of decompn., followed by the soln. of more or less of certain of the decompn. products. Tests on the durability of such silicates are rarely carried to completion and are thus really detns. of the rates of decompn. under more or less definite conditions. The effect of variation of conditions is dealt with and the paramount importance of rigidly defining these is shown. G. S. F.

103. Apparatus for controlling annealing of glassware and annealing without pyrometers. F. Twyman. *J. Soc. Glass Tech.*, **6**, 45–68(1922).—A rod of glass of the same compn. as that to be annealed is put under a strain producing deformation and is placed in the annealing chamber alongside the other articles. In two forms of the app. the extent of the failure of the rod to recover its usual position on removal is used to det. the extent of annealing, and in two other forms an additional small stress is applied in such a direction as to tend to increase the deformation; the point at which, strain having been released, the deformation begins to increase continuously, is taken as the annealing point. A method of using one form for detn. of the actual annealing temp. is described. An appendix gives a summary of formulas governing annealing, *e. g.*, variation of viscosity with temp. G. S. F.

104. Critical examination of methods commonly used in determining durability of glass. W. E. S. Turner. *J. Soc. Glass Tech.*, **6**, 30–45(1922).—Four methods of test are considered. (1) Surfaces of glass vessels. It is not easy to arrange that a given vol. of reagent always acts on a definite area, especially when the reagents are boiling or agitated. (2) The use of plates or slabs of glass has the advantage that the area in contact with the reagent or its vapor is readily controlled. To obtain good results the surfaces should be ground and polished. (3) The use of powd. glass permits results to be obtained quickly by reason of the increased surface exposed, though for comparable results it was necessary to adopt a fixed grading of grain size (*e. g.*, 20 to 30, or 40 to 50 mesh), and to wash off any fine dust with alc. before the detn. (4) The autoclave test (Baillie and Wilson, *Ceram. Abs.*, **1** [10], 260(1922)) with water is not very satisfactory, since its results are not always in harmony with those given by water at ordinary pressures. The danger of trusting to loss in weight of a glass as a measure of attack is shown by examples in which samples actually gained weight owing to hydration. The detn. of the alkali extd. is stated to be easily possible only when water is the corrosive agent. The most accurate method, though slowest, is the detn. of the total matter extd. The need for a standardized method of test is emphasized. G. S. F.

105. Action of various analytical reagents on chemical glassware. W. E. S. Turner and T. E. Wilson. *J. Soc. Glass Technology*, **6**, 17–20(1922).—The tests were made on 3 types (two English, one French) of chem. glassware; in most cases the soln. was kept in contact with the glass for 3 hrs. at 100°. HNO_3 (d. 1.2), and $2N(NH_4)_2S$ soln. had but little action on the glasses, but they were attacked to an appreciable extent by 0.5 *N* and 0.25 *N* Na phosphate soln. The French glass was attacked to a greater extent than were the English glasses by the Na phosphate solns., while there was but little difference between the 3 types as regards their resistance to alkali hydroxide solns., showing that the corrosive action of the alkali salt solns. was not due entirely to their alky. J. C. S. (*C. A.*)

106. Re-annealing of glass. W. A. Whatmough. *J. Soc. Glass Tech.*, **5**, 44–54 (1921).—The annealing of a glass prevents the development of strain only, but re-annealing, by heating glass to its softening point, releases strains already present. High ring strain is produced in articles such as specimen tubes made from glass tubing by machines with high velocity burners, and to remove this W. constructed a re-annealing oven which is very successful. In its present form it consists of a tunnel lehr, 9 in. sq.,

shaped like an inverted siphon, the mouth of the short entrance limb being at a lower level than that of the longer exit limb. The central horizontal portion is a fire clay muffle, heated by two rows of burners which can be accurately adjusted. The bottom of the tunnel, on which an endless chain tray track runs, is of cast iron, and the lagging is of slag wool between metal plates. In both limbs are draw-off valves for hot gas, and nine pyrometers are inserted. The track can be drawn through at varying rates. To prevent the cracking of long tubes by "steaming" an oven is constructed over the hot end of the long limb to give articles a preliminary warming. W. follows the conditions of the critical annealing curve as worked out by English and Turner (*C. A.*, **12**, 2240). J. S. C. I.

107. Examination of glass by polarized light. S. NAKAMURA. *J. Soc. Glass Tech.*, **5**, 57–61(1921).—N. describes a strain tester for optical glass slabs in which a sheet of black glass is used as polarizer, and is so fixed that, with polarizer and analyzer set with crossed planes, the slab is in the "diagonal position" when laid horizontally between. The degree of strain is indicated by the amt. of double refraction at the center of the slab, and this is measured by trial, a series of mica films of known retardation being used to obtain total extinction. J. S. C. I.

108. The melting of potash feldspar. G. W. MOREY AND N. L. BOWEN. *Am. J. Sci.*, **4**, 1–21(1922).—Pure synthetic orthoclase was prepared by crystg. a glass of the compn. $KAlSi_3O_8$ in a bomb with H_2O vapor. It was found that above 1170° this pure orthoclase decomposed into a liquid and leucite, the leucite becoming more apparent with increased temp. up to 1530°, where it disappeared. The significance of this fact to petrogenic theory is discussed. E. F. H. (*C. A.*)

109. Effect of magnesia on the resistance of glass to corroding agents and a comparison of the durability of lime and magnesia glasses. V. DIMBLEBY, C. M. M. MUIRHEAD AND W. E. S. TURNER. *J. Soc. Glass Tech.*, **6**, 101–7(1922).—The series tested ranged from $2Na_2O.6SiO_2$ to $Na_2O.CaO.6SiO_2$ and $2Na_2O.6SiO_2$ to $0.9Na_2O.1MgO.6SiO_2$, replacement of R_2O by MO being made in each case in ten successive steps. The resistance to boiling water, const. boiling HCl, 2*N* NaOH, and 2*N* Na_2CO_3 was detd. The magnesia glasses were superior to lime glasses over the whole range when water was the corroding agent, but were distinctly inferior to lime glasses in resistance to NaOH or Na_2CO_3. Na_2CO_3 was more corrosive to the magnesia glasses than was NaOH. Lime glasses were superior to magnesia glasses in resistance to HCl above the value MgO = 3.5 mols. %, but below this the substitution of MgO for Na_2O was more effective in improving resistance than the use of an equiv. amt. of CaO. G. S. F.

110. New plant of the United States Sheet and Window Glass Company at Shreveport, Louisiana. J. B. KRAK. *Glass Ind.*, **3**, 171–80(1922); illus. J. B. P. (*C. A.*)

111. Examination and extension of Zulkowski's theory of relation between the composition and durability of glasses. W. L. BAILLIE. *J. Soc. Glass Tech.*, **6**, 68–101 (1922).—Zulkowski (*Chem. Ind.*, **22**, 280–92; **23**, 346–59) connected the no. of mols. of simple silicates present in a glass per hundred mols. of double silicates with the durability of the glass, arguing that the simple silicates were the prime causes of instability. This theory gave good results with the plain potash-lead and soda-lime glasses, but samples contg. appreciable amts. of the R_2O_3 oxides were not considered. B. has studied 27 optical glasses, graded as unaffected, appreciably affected, or seriously affected by a filming test, by Zulkowski's method and shows that it fails with the glasses contg. R_2O_3 oxides. After quoting evidence in favor of the combination between Na_2O, Al_2O_3, and SiO_2 and of the beneficial effect of Al_2O_3 and B_2O_3 on the durability, the R_2O_3 oxides are regarded as forming silicates of the type $3MO.R_2O_3.xSiO_2$ and the remaining constituents as forming simple and double silicates as in the original theory. These com-

plex silicates are considered to be not inferior to the double silicates in durability. The general expression for the mol. percentage of simple silicates or "reactivity coeff." is developed as $(c-d)(c+d-3b)/(c+d)$, where a, b, c, d, denote molar percentages of SiO_2, R_2O_3, MO, and R_2O resp., for the usual conditions when $(c+d)>3b$. When $(c+d)<3b$ complex silicates with higher R_2O_3 content are regarded as being formed, and as being very stable, though excessive amts. of R_2O_3 may give unfavorable results, tending to devitrification and ready attack by alkali, or ready hydration in the case of B_2O_3. The theory can be regarded only as a second approximation, and while general durability can be predicted from the compn. of the glass, the behavior towards any particular reagent is uncertain. Further differences may be expected among different R_2O_3 oxides in equimolar proportions. Various tables of results are given in support of the theory. Sixty-five glasses were examd., and agreement in most cases was good. Values for "reactivity coeff." of more than 10 show an altogether unsuitable glass, of more than 5, unsuitable for chem. ware, while the value for good chem. ware is less than 3 and generally below 2. The acidity index of the glass, $a/(c+d)$, does not appear to be connected with the durability. Among the probable causes of discrepancies between the calcd. and observed results are insufficient "plaining" of the glass leading to incomplete formation of the double silicates and a corresponding excess of simple silicates, defective mfg. processes leading to cordiness and inhomogeneity generally, and reliance on a limited no. of tests to det. durability, and different methods of prepg. test pieces. The desirability of a varied range of tests for durability is stressed and B, in arriving at his results adopted the method of giving points to the glasses. Thus a no. was allotted to each glass in every test, indicative of its order of resistance to the agent employed. The sum of these numbers for a glass, divided by the no. of tests, gave its av. no. of "points" and these were the figures used in comparisons, as being the fairest and most impersonal. G. S. F.

112. Producer gas as fuel for the glass industry. C. D. Smith. *Nat. Glass Budget*, **38**, No. 18, 1, 16–7(1922). J. B. P. (*C. A.*)

113. The annealing of glass. H. W. Hess. *Glass Worker*, **41**, No. 51, 11, 27 (1922).—In making ware with automatic machines care is needed to prevent devitrification of the glass. The polariscope is of great assistance in securing proper annealing. J. B. P. (*C. A.*)

114. Boiler gage glass problems. H. W. Hess. *Glass Worker*, **41**, No. 52, 11 (1922). J. B. P. (*C. A.*)

115. Testing gage glasses. H. W. Hess. *Glass Worker*, **42**, No. 1, 11, 29(1922).—Various methods are described briefly and weaknesses noted. A dipping test from hot Hg to cool water is considered most satisfactory. J. B. P. (*C. A.*)

116. Copper ruby glass. H. Kühl. *Sprechsaal*, **54**, 383(1921); *J. Soc. Glass Tech.*, **6**, 8a–9a.—One of the oldest and most interesting works on Cu ruby glass was that by P. Ebell (1870), who, although writing before colloidal chemistry was understood, drew sound conclusions as to the cause of the color. The prepn. of Cu ruby, however, was, on the whole, not so well understood as that of Au ruby. As the two were of similar nature, the amt. of the metals used to produce the same intensity should not differ widely, but whereas, according to Müller, 1 part of Au per 50,000 parts of glass gave a bright red color, the amt. of Cu needed was uncertain, and many views were incorrect. Randau, for instance, had stated that the weight of Cu should be 2% of that of the batch. By the use of methods similar to those for prepg. gold ruby, K. had obtained the color by the use of 0.02% of Cu. Haller prepd. a beautiful ruby from the batch: sand 100, potash 30, soda-ash 2.5, limespar 12, Cu sulfide 0.02, Na_2S 0.026, borax 0.024. A ruby batch patented in 1882 had the compn.: fine sand 2000, red lead 400, potash 600, lime 100, Ca phosphate 20, K bitartrate 20, Cu_2O 9, SnO_2 13. The

Cu here was only 0.40% of the weight of sand used. Randau used a much higher propn. in the batch: sand 100, soda 18, SnO_2 20, CuO 15, Fe oxide 10. In the manuf. of copper ruby, the batch should be one melting at not too high a temp. and allowing normal working, while the Cu salt should be easily reducible and very finely divided. The melt should be of a reducing character. In many failures the fault had been due to the use of a too strongly basic batch resulting in the production of crystals of Cu_2O, in which case a liver-brown color was obtained with incident light. H. G. (*C. A.*)

117. The application of self-luminous colored decorations in the glass and ceramic industries. O. PARKERT. *Sprechsaal*, **55**, 34(1922); *J. Soc. Glass Tech.*, **6**, 23a.—The prepn. of self-luminous paints, now coming into use in America and France, depends on the use of phosphorescence phenomena such as are associated with the sulfides of the alk.-earth metals, and of ZnS. In addn. to the sulfide, such as that of Ba, Sr, or Ca, an active metal is added in the form of a salt of Bi, Mn, or U. Further, a flux is needed, and is usually provided by a salt of Li, Na, or K. A mixt. which gives violet radiation is said to be obtained from 20 g. CaO, 5.5 g. S., 2 g. starch, 1 cc. Bi nitrate soln., 0.12 g. KCl, 0.14 g. NaCl. This mixt. is heated for a lengthy period in a muffle at 1200°. For yellow colors, one may use 100 g. $SrCO_3$, 100 g. S, 0.5 g. KCl, 0.5 NaCl and 0.4 g. Mn chloride. For a green color, Sr thiosulfate 60 g., U nitrate 6 g., and Bi nitrate 10–12 g.; while for a red color, $BaCO_3$ 44 g., S 6.5 g., Li carbonate 1.2 g., Na carbonate 0.04 g., Rb carbonate 0.5 g. may be used. The mixt. is heated to glowing and appears to be most efficient when cooled rapidly. It should have a fine white appearance. Before use it is subjected to the action of strong illumination, which may be sunlight, or an incandescent gas mantle, or a Hg vapor lamp. For glass or ceramic processes, the prepn. may be mixed into the liquid glass or applied as in the glaze to porcelain. It may also be applied as a paint or as a spray. H. G. (*C. A.*)

PATENTS

118. Non fragile glass. P. B. CROSSLEY. Brit. Pat. 152,780, July 22, 1919; *Ill. Off. Jour.* (Pat's.) No. 1668, p. 5676, Dec. 31, 1920. Non fragile glass, which can be rolled, forged, extruded, cast, etc., is made by dissolving in the dry state such silicate as micaceous or asbestos minerals in molten glass or a similar silicate. The glass, etc., is chosen so as to melt at a temperature below the temp. at which the hydrous silicate effloresces. If the product is to be machined an excess of mica, etc., should be present over the amount necessary to form a satd. soln. WM. M. CLARK

119. Sealing electrical conductors into quartz. SILICA SYNDICATE, LTD. Brit. Pat. No. 185,952. Sept. 7(1921); *Ill. Off. Jour. Pat's*, p. 4891(1922). Covers a seal for elec. conductors in vitreous vacuum vessels comprising two or more wires passed thru sep. holes in a vitreous plug, or thru sep. vitreous tubes, these being placed in an enclosing vitreous tube and the whole fused together. With sketches.

WM. M. CLARK

120. Process of manufacturing optical glasses. GENZO SHIMAZU. Japan 43,203, Aug. 1, 1922. Oxides of lead are prepd. by oxidizing lead-powder by means of natural oxidation or other methods without melting. They are used to compose batches for optical glass together with quartz, sodium carbonate, lime and other usual raw materials. S. KONDO

121. Improvement in boro-silicate glass. KITSUZO FUHA. Japan 42,161, March 31 (1922). The new glass has the following compn: Silica 66.0–67.5%, alumina 1.0–1.75%, soda 7.0–8.0% and boric anhydride 22.0–24.0%. The glass adheres more air-tightly to tungsten-wire, resists more sudden changes of temp. and resists weathering better than the already-known boro-silicate glasses. S. KONDO

122. Glass molds. R. L. FRINK. Brit. 183,582, April 26, 1921. Metal molds for glass working are made with a porous or finely pitted surface. Such molds may be

made from an alloy of Al or Cu with Cu, Ba, or Mg, the surface being rendered porous by treating it with an alk. soln. A suitable alloy contains about 2% of Ca or Ba. In making such an alloy, it is recommended that an alloy contg. 75% of Al and 25% of Ca, etc., be first prepd. at a temp. of 500–1100°, and that this be added in the required proportion to pure molten Al. For use the molds may be dipped in H_2O, paraffin oil, etc. (*C. A.*)

123. Alkali metal silicate production in blast furnaces. S. Peacock. U. S. 1,425,048, Aug. 8. An alkali metal silicate suitable for *glass making purposes* is made by igniting a charge of C, SiO_2 and Na_2CO_3 in a blast furnace and withdrawing the slag produced. (*C. A.*)

124. Furnaces containing melting pots or crucibles. J. U. McDonald. Can. 221,315, July 25, 1922. (*C. A.*)

125. Glass. F. M. Locke. U. S. 1,431,166, Oct. 10. Glass having a coeff. of expansion of not more than 0.0000035 and adapted for the manuf. of culinary or chem. ware is formed of SiO_2 78, B_2O_3 15, Na_2O 4, CaO 1, K_2O 1 and Al_2O_3 1%. (*C. A.*)

126. Glass. A. L. Duval d'Adrian. U. S. 1,430,725, Oct. 3. $MgBr_2$ 1/2–50, lbs. or other Br salt is added to a glass-forming compn. which may contain sand 1000, Na_2CO_3 360–380 and limestone 200–220 lbs. in order to eliminate greenish color due to Fe present in the materials used. (*C. A.*)

127. Continuous annealing furnace. M. Van Marle. U. S. 1,429,380, Sept. 19. Articles are carried through the furnace on an endless conveyor which passes through seals at both ends of the furnace. (*C. A.*)

128. Glass. E. C. Sullivan and W. C. Taylor. Can. 220,748, July 11, 1922. A glass having a linear expansion coeff. of more than 0.000012 and a hardness of 640° contains SiO_2 42, soda 19, potash 5, BaO 19, and Al_2O_3 15%. Cf. *C. A.*, **15,** 1608; **16,** 1644. (*C. A.*)

129. Glass. W. C. Taylor. Can. 220,441, July 4, 1922. A glass contg. SiO_2 B_2O_3 Li_2O and Al_2O_3 has a coeff. of expansion of less than 0.0000056. (*C. A.*)

130. Hollow glass articles. E. Frank. U. S. 1,420,996, June 27. A long clear glass tube is coated with opaque material at intervals preparatory to reheating and blowing to form incandescent lamp bulbs or similar articles. (*C. A.*)

131. Non-shatterable glass. O. S. Marckworth. U. S. 1,421,974, July 4. Assembled laminas of glass and celluloid are immersed in a soln. of fusel oil, camphor, and methyl salicylate at a temp. of 24–35° and the laminas are subjected to pressure together and more highly heated in the soln. (*C. A.*)

132. Melting glass. R. Good. U. S. 1,421,210–11, June 27. Mech. features. (*C. A.*)

Enamel

133. Something better in enamel smelters. H. E. Davis. *Chem. and Met. Eng.*, **27,** 1210(1922).—A description of a new type of enamel smelter, using oil as fuel. The general construction of the furnace and some data as to the cost of operation are given.
R. R. Danielson

134. The development of industrial electric heating for low temperature enameling. W. S. Scott. *Trans. Am. Electrochem. Soc.*, **42,** preprint, 1922.—Early expts. are recorded which point out the great importance of adequate ventilation of an elec. enameling oven. During the drying of the enamel combustible gases are evolved and these must be withdrawn in such a way as to avoid explosions. The suspensions and arrangement of the heating units are discussed. Typical elec. oven installations of the automotive and typewriter industries are illus. and described in detail. Cf. *C. A.* **16,** 3263.
C. G. F. (*C. A.*)

135. Enameling. N. MEURER. Brit. 179,216, Nov. 27, 1920. In enameling metal, ceramic, or other heat-resisting articles by spraying enamels, glass, or mixts. rich in quartz on to the articles by means of gases under pressure, the surface of the article is heated by the spraying jet to the fusing temp. of the coating material, and the flame that effects the melting and heating has a reducing action to prevent oxidation. A suitable construction is specified. (*C. A.*)

136. Enameling furnace. TAKEO NAGASAWA. Japan 39,806, Sept. 8, 1921. A muffle furnace in which materials are revolved during heating is specified. (*C. A.*)

Cement, Lime and Plaster

137. Storage and transportation of portland cement. W. F. MYERS. U. S. Bureau of Mines, Serial No. 2377(1922).—See *Bull. Amer. Ceram. Soc.*, **1** [10], 264 (1922). R. R. DANIELSON

138. Working a lime-stone quarry. PIERRE PREVOST. *Rev. Mat. Constr. Trav. Pub.*, **157,** 189–91(1922).—At Louvières, Vitry-Le-François (Marne, France), 4,500 T. of lime-stone were blasted at one time by detonating 230 kgs. of dynamite set in four holes, 20 cms. in diameter, drilled 19 m. deep and 6 m. apart. LOUIS NAVIAS

139. Tests on the double burning of lime, and the value of cements of high hydraulic index. F. B. JEANNERET. *Rev. Mat. Constr. Trav. Pub.*, **158,** 213–5(1922).—(1) Penetration tests in alk. sulphide solution are given for diff. types of pure binders, for tamped 1:3 mortars, and for untamped 1:3 plastic mortars. (2) Graphically and in table form are given the results of tests on lime burned directly to 1400° and on samples first fired to 1100°, then cooled, made into blocks, and fired to 1300–1400°. Chem. compns., and results on compression and tensile strengths for the cements are given. The only conclusion drawn is that binders of high hydraulic index show their max. properties when they have a $CaCO_3$ content of 72–75%. LOUIS NAVIAS

140. Function of the laboratory in cement manufacture. J. C. WITT. *Cement Mill and Quarry*, **21,** No. 9, 31–2(1922).—From selecting the raw materials to turning out the finished product, cement manuf. which is essentially a chemical process, requires lab. control. J. C. W. (*C. A.*)

141. Some generalizations on the influence of substances on cement and concrete. J. C. WITT. *Philippine J. Sci.*, **17,** No. 10(1922); cf. *C. A.*, **12,** 1113; **13,** 895.—The final results obtained in a research started at the Bur. of Science, Manila in 1916 are given. The effect of NaCl, $ZnCl_2$, $CuCl_2$, $NaNO_3$, KNO_3, NH_4NO_3, Na_2SO_4, $ZnSO_4$, $CuSO_4$, $NaHCO_3$, and $KHCO_3$ has been studied. The 2700 tensile tests indicate that when cement is mixed with normal solns. of these salts the general effect is a slight decrease in strength, though in many cases there is an increase. J. C. W. (*C. A.*)

142. The remelting of acid blast-furnace slags and cement. RICHARD GRÜN. *Stahl u. Eisen*, **42,** 1158–67(1922).—The prepn. of Portland cement out of acid blast-furnace slag is possible by adding lime and clay to the hot liquid slag. The clay should be added before or with the lime. The addn. of lime up to the compn. of Port. cement is not necessary but may be limited to about 50%. R. S. D. (*C. A.*)

143. The effect of sulfur compounds on cement. J. C. WITT. *Philippine J. Sci.*, **17,** No. 10(1922); cf. *C. A.*, **12,** 88, 616; **13,** 3300; **15,** 1835.—The final results obtained in a research started at the Bur. of Science, Manila, in 1915 are given. Five-year neat and mortar briquets show little decrease in strength due to the presence of Na_2S in the mixing water in quantities up to 1 g. S^{--} per l. A max. decrease of approx. $^1/_3$ the strength results with 10 g. S^{--} per l. Three-year neat and mortar briquets made with cements contg. varying amts. of SO_3 show little difference in strength (up to 5% SO_3). Decided lowering of strength and in some cases disintegration, are caused by 9% to 10% SO_3 (in 5 of the 6 cements used). J. C. W. (*C. A.*)

144. The utilization of the waste heat of rotary cement kilns. J. Bied. *Chimie et industrie*, **8**, 528–30(1922).—The amt. of heat carried away by the waste gases in the dry process is calcd. It is proposed to use this heat for generating steam. Installations at the plant of the Trinity Portland Cement Co. (*Rock Products*, No. 23, Nov. 5, 1921) and at the Leimen plant of the Heidelberg Portland Cement-Werke (E. Schott, *Ton-Industrie*) are described. Schott proposes a "compound kiln," consisting of a rotary for clinkering and a vertical for decarbonating by means of the waste gases (at 1300°) from the rotary. A certain amt. of coal would be required in the vertical kiln.
A. P.-C. (*C. A.*)

145. Industrial chemistry problem relative to the treatment of cement. (Influence of the addition of calcium chloride on the strength of Portland cement.) C. R. Platzmann. *Zement*, **11**, 137–8, 151–3(1922); *Chimie et industrie*, **8**, 614(1922); cf. *C. A.* **16**, 2586.—$CaCl_2$ 2.4–5% was added with the water in mixing the mortar to hasten hardening and prevent cracks due to shrinking. The temp. of setting was detd. by means of Killig's app. Though this indicated only part of the heat generated, the relative temps. obtained were interesting. The tests were carried out with a com. cement and with a slag cement. The av. tensile and crushing strengths at the end of various periods of time and for various percentages of $CaCl_2$ are tabulated. The addn. of $CaCl_2$ improves the constancy of the vol. and increases the generation of heat during setting. Finally, the cement is less readily attacked by various gases which in the presence of water form H_2SO_3 and H_2SO_4. A. P.-C. (*C. A.*)

146. A Rumanian cement mill. P. F. Bagge. *Concrete* (Cement Mill Section), **21**, 19–25(1922).—B. discusses the raw materials, fuel, labor, equipment and mfg. processes of the Tordaer Cement Works. J. C. W. (*C. A.*)

147. A study of conditions causing disintegration of cement under the "accelerated" test. A. G. Fleming. *J. Soc. Chem. Ind.*, **41**, 300–2T(1922).—That the accelerated steam test on cement is unnecessarily severe and does not always indicate the quality of the cement has led to these conclusions from a series of expts.: (*a*) The chem. compn. of an av. Port. cement gives little guidance as to its possible behavior under the accelerated test. (*b*) Unsound cement stored under water shows a marked improvement compared with that stored in air, either dry or moist; the natural storage for cement, at any rate during hardening, is under water. (*c*) Mortars poor in unsound cement improve more rapidly than mortars rich in unsound cement. There is thus little danger of disintegration of a water-stored concrete made from what are ordinarily termed "poor" cements. (*d*) Mortars in practice do not exhibit the weakness of their neat cement. (*e*) Mortars and concretes are improved by water-storage; concrete should be kept moist, at any rate until completely set. The disruptive force exhibited in the accelerated test is due principally to the free lime incorporated in the clinker particles and this force is not discovered except by rapid hydration. That the combination of the alkali bases with CO_2 from the air and S from the sulfides of the clinker may be also responsible for unsoundness is indicated from the expts. Fine grinding of raw mix to insure more intimate combination of the elements has eliminated much of the danger of unsoundness. C. N. W. (*C. A.*)

148. Electric cement. Anon. *Rev. ing. index tech.*, **29**, 155–7, 197–8(1921); *France-Belgique*, **1**, 71–2, 199–200(1922).—"Electric cement" is an aluminous cement manufd. in the elec. furnace. The essential component is $Al_2O_3.CaO$ or the eutectic $3Al_2O_3.5CaO$. The hydraulic index is generally above 1. The apparent d., with a degree of fineness such that 5% remains on a sieve of 4,900 meshes per cm^2., is not over 1. When tested hot with LeChatelier cylinders it does not swell, and its contraction on setting is the same as that of ordinary cement. It is not decomposed by the sulfates of the alkalies or alk. earths or by sea-water; it hardens rapidly; with 300 kg. of cement

to 1 m.^{3} of sand, the strength after 48 hrs. is more than double that of a similar mixt. of artificial Port. cement after 90 days. A. P.-C. (*C. A.*)

149. Process of burning pulverized fuel in which Portland cement is obtained as by-product. Tsuneichi Fujiyama. Japan 43,420, Sept. 8, 1922. Lime and small amts. of quartz or other similar subs. are mixed to pulverized fuel in such a propn. that they compose Port. cement with the ashes of the fuel. The pulverized mixt. is burned with air-blast to heat boilers or other app. and to produce cement-clinker at the same time. S. Kondo

150. Marble-cement. Kihichi Nakamura. Japan 43,347, Aug. 28, 1922. Pieces of glass or pattern-plates of various shapes are scattered on a base-plate which has previously been coated with celluloid or glue and has a frame on it. A colored mortar composed of sodium silicate, Port. cement, coloring matter and water is poured on the plate as thick as the glass-pieces or the pattern-plates. They are then picked out and similar mortar of different color is poured in their places. Then cracks are formed in the mortar by inserting a spatula to the surface of the film and moving it at places. The cracks are now filled with similar mortar of another color. The artificial stone, thus obtained, is soaked in the soln. of sodium silicate and is then polished. Marble, granite and other natural rocks can be imitated by the process. S. Kondo

151. Process of manufacturing paving material. Komakichi Kato and Chiaki Kamibayashi. Japan 42,701, May 30, 1922. The ground Soja bean is treated with the soln. of an alkali. Any sol. aluminium salt and coal-dust are added to the product. The mixt. is used in paving together with cement, lime, sand, etc. S. Kondo

152. Material for artificial stone. Toyoji Hatanaka. Japan 42,502, May 8, 1922. A white powder consisting of magnesia, zinc oxide, ground glass or other mineral subs., white Port. cement and clay, and a soln. of magnesium chloride, Gloiopeltis furcata (a kind of glue) and alum in water are used in making artificial stones. Magnesium chloride is sometimes excluded from the soln. S. Kondo

153. Paint for water-proofing cement. Nakajiro Mano and Ryujiro Yanaka. Japan 42,350, April 18, 1922. Fatty acid and solid paraffin are dissolved in naphtha of low m. p. S. Kondo

154. Pitch-cement. Ichita Kishi. Japan 42,291, April 12(1922). It relates to a pitch-cement which is prepd. by melting a mixt. of the pitch of petroleum, coal, brown coal or peat and magnesia. S. Kondo

155. Magnesia sheet. Sachio Miki. Japan 42,194, April 4(1922). Wires of a coarse wire-netting are cut at many points and their ends are bent up- or downwards. A paste composed of magnesia and fibrous subs. is applied on both surfaces of the netting. It is used for insulating heat. S. Kondo

156. Process of manufacturing plaster of Paris. Seikichi Fukuzawa, Ito Fukuzawa and Toyo Gips Co. Japan 43,679, Oct. 11(1922). The product of chem. reaction between sulphuric acid and lime is left in a heap until the grains get spheroidal shape. They are then washed with water to get rid of magnesium sulphate. They are again left in heap until they get spheroidal shape. They are then used in the manuf. of plaster of Paris. S. Kondo

157. Asbestos-cement. R. V. Mattison. U. S. 1,423,000, July 18. A mixt. adapted for making shingles or blocks is formed from hydraulic cement, asbestos fiber, H_2O and heavy petroleum oil. (*C. A.*)

158. Oxychloride cement. C. Catlett. U. S. 1,422,337, July 11. Solid lime and solid $CaCl_2$ are mixed in finely divided condition to form a stable oxychloride nearly free from a tendency to form lumps. Cf. *Ceram. Abs.*, **1** [4], 122(1922). (*C. A.*)

159. Molding and coloring artificial stone. B. R. WHITBY. Brit. 178,736, May 10, 1921. Colored artificial stone with a glazed surface is produced by filming one side of a glass plate with cement mixt. colored as required, allowing the film to set on the glass, and then placing the latter in a mold, of which it forms a removable lining, and filling up with cement, concrete, etc. (*C. A.*)

CERAMIC ABSTRACTS

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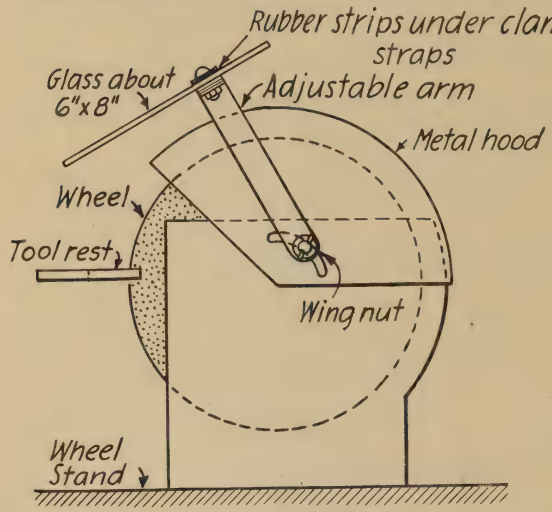
[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts* by coöperative agreement.

Abrasives

1. Glass shield for emery wheel. ANON. *Queensland Gov. Min. Jour.*, **23**, 422 (1922).—The glass shield shown in the accompanying illustration has been found of considerable value in protecting operators of emery wheels. It obviates the use of goggles, with all their attendant troubles, such as broken parts, dirty lenses, and the general dislike manifested toward them. In addition, the operator cannot inhale the particles thrown up by the wheel. This is a greater menace than is ordinarily supposed, as large numbers of these particles are not visible but show their presence by pitting the shield. The glass used is a piece of plate from a broken windshield, and all the material is usually available in the ordinary shop. By mounting the glass in a hinged holder, it can easily be pushed out of the way when desired. Various adaptations can be made so that the shield will work without interfering with the usual operations in a shop. O. P. R. O.



2. Abrasives—an outline of their history. M. HANEY. *Raw Material*, **5**, 350–2 (1922). E. J. C. (*C. A.*)

Art

3. Color designation. HEINRICH TRILLICH. *Farben-Ztg.*, **27**, 3323–4, 3379–80 (1922).—Cf. *Ceram. Abs.*, **1**, 256(1922); *ibid.*, **1**, 322(1922). F. A. W. (*C. A.*)

Cement, Lime and Plaster

4. Automatic vertical furnace for the baking of cement. E. CANDLOT. *Chimie et Industrie*, **8**, 1206(1922).—The rotary furnace, now generally used, has several disadvantages namely, increased consumption of coal, use of considerable motive force, and loss of time caused by the frequency of delays for repairs. The uninterrupted working period of a rotary kiln is generally only 3 mos. and sometimes less. The vertical furnace is free from these faults to a greater extent and therefore research workers in France have been working on perfecting an automatic vertical furnace with device for loading and unloading. A history of the progress made from 1913 is given; the different makes of furnaces used and the choice of the most advantageous diam. The quality of cement obtained is of the highest. The cost of installation is much lower than that of the rotary furnace. Considerably less fuel and power is used in operation. With these advantages the new system of furnace ought to be widely adopted. It is, as yet, practically unknown on this continent, but is being very successfully operated in several large French plants. O. P. R. O.

5. Caustic magnesia cement. ANON. Bur. Standards, *Circ.* **135**(1922).—The cement resulting from the reaction of caustic magnesia with a soln. of magnesium

chloride has been known for more than half a century, and some of the products made therefrom, in the form of resilient flooring, stucco, and ship decking, have been on market for considerably more than half that period. References are given to the discovery and early history of this cement. A summary of the investigative work dealing with the process and products of setting is presented. Certain tentative test requirements and methods for conducting tests of the oxide are given. H. F. STALEY

6. Influence of the hardening of cement and lime mortars in steam under pressure on the mechanical strength of these mortars. LÉON BERTRAND. *Bull. officiel direction recherches sci. ind. inventions*, No. **36**, 608–15(Oct., 1922).—Steaming under 8 kg. (per cm.^{2}) for 3.5 hrs. doubles the strengths of neat cement and of mortars (1 of cement to 2 of sand), and gives them the same hardness as test pieces kept at ordinary temp. for a month. Too rapid cooling affects the strength adversely. The conditions of further tests on cement and hydraulic lime are described in detail and the results are tabulated and shown graphically. The strength of the pieces treated in the usual manner increased during the whole 12 weeks of the tests. In pieces treated in the autoclave, the tensile and crushing strengths both decreased fairly rapidly, reached a min. in less than 7 days, and then increased fairly rapidly, the lime regaining its initial strength and the cement exceeding it. The similarity in the behavior of the lime and of the cement tends to show that the phenomena of setting are of the same nature in both and probably related to the development of aluminates. The action of steam in the autoclave treatment causes a progressive transformation which gives rise to some unstable form of combination, which gradually changes to a stable state. As the strength of the steamed test pieces is in every case much higher than that of the unsteamed pieces, the final stable state of the former must be quite different from the final state obtained by ordinary setting in a moist atm. or under water at the ordinary temp.
A. P.-C. (*C. A.*)

7. A study of chemical reactions in the burning of lime and portland cement. G. A. RANKIN. *Concrete* (Mill section), **21**, 72–77(1922).—The paper is principally concerned with the cement kiln but some of the data are also applicable to lime burning. Three series of reactions are considered: (1) the driving off of CO_2, (2) formation of the clinker, and (3) the burning of fuel. The work involves the investigation of samples taken every 10 ft. throughout the length of a 125-ft. kiln (the ordinary chem. analysis is supplemented by microscopic examns.), and lab. expts. On the basis of this work, the work of other investigators, and theoretical considerations, R. concludes that the first two series of reactions take place economically but the third is not economical. The temp. of the flame should be increased; one way to do this is to supply O for burning the fuel rather than air. J. C. W. (*C. A.*)

Glass

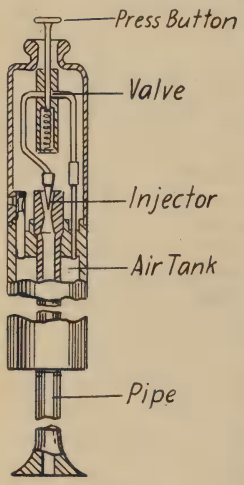
8. Silica glass, its properties, history and manufacture. GEORGES FLUSIN. *Le Verre*, **2**, 145–53, 171–7, 193–8, 217–21, 241–4, 266–73(1922).—A complete detailed review of the phys. and chem. properties of the allotropic forms of silica, with special reference to silica glass, to which is appended a bibliography of 130 references subdivided according to the headings, allotropic transformations of silica, volatilization, density, expansion, sp. heats and transformation, thermal cond., optical properties, elec. resistance, devitrification of silica glass, melting points of silica, mechanical properties, permeability to gases, chem. properties of silica glass. The history covers the various mfg. companies in England, Germany, France, Switzerland and the U. S. A. The manuf. of silica glass considers the different types of furnaces (with cuts) used, and the making of semi-opaque and transparent varieties, also the silica glasses containing ZrO_2 and TiO_2. The devitrification of silica glasses, and their uses complete the series.

Some 80 patents on silica glass are listed, together with 60 references on the silica glass industries, which seems to be complete to 1920. LOUIS NAVIAS

9. Glass manufacture—India. C. S. FOX. *Bull. of Indian Indus. & Labour*, **29**(1922).—This bull. gives the early history of glass; reviews the glass industry in India and defines the properties common to the many varieties of glass. A flow sheet is given, showing a general idea of the glass manuf., beginning with the raw materials most commonly used; the treatment they receive prior to being added to the furnace as "batch;" the processes to which the plastic glass is subjected in making the various types of glass ware; and the tempering and finishing operations involved before the product is ready for market. Prepn. of the batch is discussed; glass furnaces are described, with accompanying cuts; glass and glassware, manuf. of different kinds of glass, annealing and finishing operations are discussed. The field is attractive from a business point of view, and with the establishment of several carefully located glass works not only would the Indian demand be met, but the whole eastern market would in time be supplied. O. P. R. O.

10. Unbreakable glass in Czecho-Slovakia. M. V. HORÄK. *Pottery Gazette & Glass Trade Rev.*, **48**, 300(1923).—*Reutzer Trade Service* reports establishment of a firm for the exploitation of a new process for the manufacture of unbreakable and non-fusible glass discovered by a Czech engineer, M. V. Horäk. O. P. R. O.

11. Mechanical glass-blowing.—Use of compressed air. ANON. *Industrial Austral. & Min. Standard*, **48**, 891(1922).—A Hamburg engineering correspondent of the *Times Trade Supp.* gives some particulars of a mechanical glass-blowing device. In the manuf. of sheet glass, he says, the blowing pipe still remains a most important tool. It consists of an iron tube about $4^1/_2$ ft. long. On one end of it is gathered a mass of molten glass, and this the blower forms into a large elongated cylinder by blowing down the tube, the operation being assisted by gravity and by rotating the tube. To replace this process of blowing by the mouth, which is necessarily irregular, a method which makes use of compressed air has been devised by W. Lippold, of Dresden. The compressed air, however, is not used directly, but is employed to draw, by a jet action, a small stream of air into the pipe. A compressed air reservoir is combined with the pipe, which is, therefore, independent of any air hose, and can be turned in any direction as easily as a mouth-pipe. Regulation of the air stream can be effected very exactly by a small valve worked by a press-button, which is pressed by the chin of the blower or by a finger. If a blower makes 60 cylinders, each 4 ft. long and $1^1/_2$ ft. in diameter, in 8 hrs., he has to blow in some 400 cu. ft. of air. The mechanical blowing pipe saves him this exertion, and also, it is said, considerably increases the output. O. P. R. O.



12. Some observations made on the electrolytic migration of sodium through glass. M. PIRANI AND E. LAX. *Z. tech. Physik*, **3**, 232–5(1922).—The film of water which persists inside of an evacuated glass tube was removed by the migration of Na ions through the glass. A tube shaped like a lamp bulb and contg. a small W wire was evacuated and immersed in molten $NaNO_3$ at 450°. The wire was heated to a high temp. and a potential of 200 v. was applied between the wire and the molten bath. Na ions migrated through the glass and a yellow luminescence was produced in the tube. The H_2O film was displaced by this process and was attacked by the hot W as evidenced by the formation of a film of blue WO_3 on the tube. After 10–15 min. the H_2O film was

entirely removed. The method was used for making a Na glow-tube for demonstration purposes. H. B. W. (*C. A.*)

13. Problems of the German glass industry. H. Kühl. *Chem.-Ztg.*, **46**, 990–2 (1922). E. J. C. (*C. A.*)

14. Pyrex glass. Paul Emile Erckmann. *Chimie et industrie*, **8**, 785–91(1922).—A discussion of the requirements of an ideal glass, with a description of the compn. and merits of Pyrex glass and its uses. A. P.-C. (*C. A.*)

15. Operating life of tanks. H. W. Hess. *Glass Worker*, **42**, No. 5, 13(1922). J. B. P. (*C. A.*)

16. Raw material selection. H. W. Hess. *Glass Worker*, **42**, No. 7, 13; No. 8, **13**, 40(1922).—Natural products such as sand, feldspar, etc., need careful checking while trouble caused by impurities in manufd. articles such as soda ash, litharge, etc., is comparatively rare. J. B. P. (*C. A.*)

17. Glass industry fuel waste. A. J. Rittman. *Glass Worker*, **42**, No. 9, 13, 38, 40(1922).—There is still much unnecessary waste of fuel due to improper manipulation of valves and dampers in the furnaces and the use of too much steam in the producers. J. B. P. (*C. A.*)

18. The chemist in the glass factory. H. W. Hess. *Glass Worker*, **42**, No. 10, 21–2(1922). J. B. P. (*C. A.*)

19. Fire polishing glassware. H. W. Hess. *Glass Worker*, **42**, No. 11, 11, 29 (1922).—Sulfuring is remedied by changing the flame from a reducing to an oxidizing condition where it impinges upon the ware. Irregularities in pressure and quality of the gas must be avoided. Compressed air should be scrubbed as it contains dust and oil. The flame temp. of natural gas is insufficient for some purposes, it being often necessary to change to artificial coal gas of lower calorific value but higher flame temp. J. B. P. (*C. A.*)

20. Detecting stoppages in furnaces by vacuum readings. Henry W. Hess. *Glass Worker*, **42**, No. 4, 13(1922).—Under normal conditions a glass furnace should show a positive pressure of the contained gases at the edge of the crown. Half way down, the gases should show a slight pressure and at the floor level, the condition should be approx. balanced between pressure and vacuum. At the outlet of the waste gas checkers there should exist a slight vacuum, while a waste gas flue which does not leak too much should show a steady rise in vacuum to the base of the stack where it should measure from $^3/_8$″ to $^5/_8$″. J. B. P. (*C. A.*)

PATENTS

21. Glass-grinding machine. Harry M. Barbeau. U. S. 1,430,879, Oct. 3, 1922. The combination of a rotary grinding member, a member for supporting a plurality of sheets of glass edgewise, the supporting member being located to the grinding member, means for raising and lowering one of the members to adjust distance between the 2 members, and means for rotating both of the members. C. M. S., Jr.

22. Apparatus for and method of drawing sheet glass. Joseph P. Crowley. U. S. 1,428,533, Sept. 12, 1922. In an app. for continuously drawing sheet glass, a rotary device for flattening the sheet carrying surface of the device comprising a series of plane surfaces symmetrically arranged about the axis of the device, and sharp wear-resisting members at the edges formed by the intersecting plane surfaces, the edges engaging and holding the sheet, and the sheet being flattened upon the intermediate plane surface. (Cf. *Ceram. Abs.*, **1** [12] 332(1922).) C. M. S., Jr.

23. Glass. Fred M. Locke. U. S. 1,431,166, Oct. 10, 1922. A glass containing silica, boric oxide and an alkali earth, and having a coeff. of expansion not greater than .0000035. C. M. S., Jr.

24. Apparatus for manufacturing glass articles. WILLIAM J. MILLER. U. S. 1,428,855, Sept. 12, 1922. In a paste mold machine, a revolving support, a fixed gear axially aligned with the support, pairs of pipe rotating rollers moving with the support, gears carried by the rollers and meshing with the fixed gear to rotate the rollers, and means for resiliently pressing the rollers into engagement with the blow pipes. C. M. S., JR.

25. Apparatus for the production of spun glass. GEDEON VON PAZSICZKY. Germany. 1,427,014, Aug. 22, 1922. An improved app. for the production of spun glass having outflow orifices in its bottom plate, a vertical tube in the receptacle having inflow ports adapted to register with the inflow ports of the vertical tube so that a determined quantity of molten glass can flow from the receptacle into the inner revolvable tube, means for exerting a pressure upon the molten glass in the inner tube, and a revolving cylinder under the receptacle upon whose surface the drops of glass adhere which come off the orifices and around which the glass threads are wound which are drawn by the drops. C. M. S., JR.

26. Glass-grinding machine. EDWARD A. RYON. U. S. 1,429,106. Sept. 12, 1922. In a glass banding machine, a cutting member, a swinging support movable toward and away from the cutting member and a rotatable workholder pivotally mounted on the swinging support and thereby adjustable to vary the angle of the face of the work with respect to the face of the cutting member and yieldable means at the side of the cutting wheel for engaging and supporting the work as it is pressed against the cutting wheel. C. M. S., JR.

27. Apparatus for and method of producing charges of molten glass. LEONARD D. SOUBIER. U. S. 1,428,994, Sept. 12, 1922. In gob forming app., the combination of a container for molten glass having an outlet opening through which the glass issues, means to periodically sever the glass at a point adjacent the opening, means to subject the issuing glass to a reduced pressure without mechanical contact with the glass during the initial portion of each period after the glass is severed, and a regulator operating periodically within the container to exert an expelling force on the glass after it has been subjected to the reduced external pressure. C. M. S., JR.

28. Glass manufacturing machinery. SAMUEL E. WINDER. U. S. 1,431,436, Oct. 10, 1922. In a glass mfg. machine, glass blowing mechanism, means for transferring the blanks from the molding mechanism to the blowing mechanism, the means comprising a clamp for grasping one end of the blanks, means for enclosing the other end of the blanks, and means for elevating and lowering the clamp independently of the enclosing means. C. M. S., JR.

Heavy Clay Products

29. Recommended minimum requirements for small dwelling construction. BUILDING CODE COMMITTEE. Bur. Standards, *Report* (1922).—Investigation by a Congressional Committee during 1919 and 1920 disclosed that existing building laws, through variations and inconsistencies of their provisions and through unduly restrictive or expensive requirements, were operating to prevent needed activity in the building industry. The Committee recommends that building codes permit 8-in. solid brick and 6-in. solid concrete walls for $2^1/_2$-and 3-story dwellings accommodating not more than two families each; that 8-in. hollow building tile, hollow concrete block, or hollow walls of brick (all rolok) shall not exceed 20 ft. in height to the gables; and that frame construction be limited to $2^1/_2$ stories. Metal lath and plaster on wood studs properly fire-stopped is approved for party and division walls, but at least every alternate wall in row houses must be 8-inch solid brick or concrete or 12-inch hollow building tile, concrete block, or hollow wall of brick. Live loads to be required as bases for design

are 40 pounds per sq. ft. for floors of wood, and 30 for those of monolithic type, or of solid or ribbed slabs. Foundation walls of brick are required to be 12 inches thick for excavated enclosures, and similar concrete walls shall be as thick as the walls they support but not less than 8 inches. Special hollow building tile 12 inches thick is permitted for foundation walls of frame buildings. H. F. STALEY

30. Test of a hollow tile and concrete floor slab reinforced in two directions. W. A. SLATER, ARTHUR HAGENER AND G. P. ANTHES. Bur. Standards, *Tech. Paper* **220**, (1922).—A large slab, 48 by 115.5 ft. center to center of outer supporting girders, was loaded. In the 48 ft. dimension the slab was divided into three spans of 16 ft. each. In the 115.5 ft. dimension it was divided into six spans, two end spans were 16 ft. each, the two middle spans 19.25 ft. each, and the two spans at the other end were 22.5 ft. each. Girders extended along all panel edges, and columns stood at all intersections of girders. The slab was 6 in. thick over all and was made up of 6 by 12 by 12 in. clay tiles laid in rows parallel to the panel edges with ribs of concrete 4 in. wide and 6 in. deep between rows of tiles in both directions. Each concrete rib was reinforced with one $^1/_2$-in. round bar in the top for negative moment and with the same moment extended out into the panel one-fourth of the span length in the direction of the bar and were there hooked for anchorage. The slab reinforcement had a yield point of about 54,000 and the girder reinforcement of about 46,000 lb. per sq. in. According to current methods of design, the working loads (sum of live and dead loads) for the three sizes of panel would be 83, 67, and 48 lb. per sq. ft. for the square, intermediate-size, and long interior panels, respectively. The weight of the slab was approximately 50 lbs. per sq. ft. For about two months the square panels stood under a uniform load (sum of live and dead loads) of about 450 lbs. per sq. ft., the intermediate-size panels under 330 lb. per sq. ft., and the long panels under 280 lb. per sq. ft. The load was then shifted and (with smaller loads on adjoining panels) the loads for the succeeding 6 months on certain panels were: square panels 780, intermediate-size panels 655, and long panels 555 lb. per sq. ft. Finally the load was concentrated still more and for about 11 months the loads on single panels of each size have been: square panels 1463, intermediate-size panels 1234, and long panels 970 lb. per sq. ft. Both the deformations and the deflections increased when the load remained constant over a considerable time, but the fact that so great a load has been carried for so long a time without excessive deflection removes any misgiving as to the adequacy of the form of construction used. H. F. STALEY

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31. Hollow tile building block. AUSTIN F. JONES. U. S. 1,432,068, Oct. 17, 1922. In a building element of the character described a hollow block grooved upon its outer face to represent a plurality of superimposed bricks with a plurality of interlocking projecting portions extending from the end of each block adjacent to its outer face the projecting portions having a relatively wide base adjacent the block and tampering in a blunt outer end the projecting portions alternating with recesses in the body of the block shaped to receive like interlocking projecting portions of a similar block when placed in adjacent relation. C. M. S., JR.

32. Interlocking brick. CHARLES H. LEICESTER. British Columbia. 1,431,530, Oct. 10, 1922. In a wall construction of the character described with the bond laid longitudinally, a plurality of layers juxtaposed blocks, key portions on the blocks forming spaces, the key portions of the blocks in one row of blocks fitting into the spaces formed by the key portions on the opposite side of the blocks in the adjoining row, and keyless blocks to form the upper and lower rows for forming openings between the upper and lower rows and the rows next adjoining the upper and lower rows.

C. M. S., JR.

33. Interlocking brick. JESSE C. MARTIN, JR. U. S. 1,431,318, Oct. 10, 1922. A brick having bosses upon a surface thereof and receptacles indented upon the opposite surface thereof, the bosses and receptacles being coaxial and being spaced equally from an end, the sides and the center line of the brick, the depth of the receptacles being greater than the height of the bosses. C. M. S., JR.

34. Tiling block. JOHN T. PRATT. U. S. 1,432,567, Oct. 17, 1922. A tile having a backing substantially rectangular in shape, the backing having one side and one end wall beveled, the backing having the outer side and end wall beveled opposite to the side and end wall first mentioned, and attaching flanges secured to and projecting beyond the backing at one side and one end thereof. C. M. S., JR.

Refractories

35. Refractories. P. S. DEVEREUX. *Jour. of Birmingham Met. Soc.*, **8**, 53–64.—A review of the whole subject of refrac. materials as follows: resistance to destructive agents; crushing strength; effects of load on various fire bricks; chromite, magnesite and dolomite refrac.; higher refrac. such as carborundum, fused alumina, zirconia, etc.; standardized testing and conservation of fuel. A paper given before members of the Society with discussion. O. P. R. O.

PATENT

36. Refractory heat-insulation. F. OTTMAN. U. S. 1,435,416, Nov. 14. A compn. suitable for building fire-resisting walls is made from kieselguhr 81 mixed with fibrous asbestos 9 and Ca phosphate (formed from lime and H_3PO_4) 10 parts. (*C. A.*)

Whitewares

37. The burning of porcelain. G. H. BROWN. *New Jersey Ceramist*, **1** [3], 204 (1921).—A discussion of the principles controlling the burning of porcelain. Failure to burn out all of the carbon from ball clay may give rise to a slight swelling of the ware and a spongy structure. It is recommended that in the firing, fuel should be introduced in relatively small charges at frequent intervals, rather than heavy charges at long intervals. The method employed in burning porcelain in Europe is discussed at length, following the information given by Dr. A. Heinecke, Director of the Royal Porcelain Factory, Berlin. The European practise is summarized as follows: (1) The ware is biscuited at a low temp. (about cone 09) reducing conditions being maintained throughout. If the chemically combined water is not completely driven out, it will retard diffusion of the reducing gases and reduction will be incomplete toward the center of the piece. Deposition of carbon may occur due to the reaction between the water vapor and hydro-carbon gases. This carbon may be removed only by prolonged heating under oxidizing conditions. From 3 to 5% carbon monoxide should be present in the kiln gases. Black smoke should be avoided. (2) Glost burning is divided into three periods, the "heating up," the reducing and the finishing periods. Deposition of tarry distillate products in the porous ware may subsequently cause blow holes, or pockets, unless this carbonaceous material is carefully removed by oxidation. (3) Oxidizing conditions are maintained during the heating up period, which extends from the beginning of the burn to the softening of cone 09. (4) Reduction extends from cone 09 to cone 8 or 9, the latter point depending somewhat upon the constitution of the body and of the glaze. The fuel gases may contain 5% hydrogen and carbon monoxide. Heating should not proceed too rapidly. Iron which has been converted into ferric oxide during the preparation of the body may be reduced to metallic iron in the body or glaze. Bodies containing iron in this form should be lightly oxidized toward

the finish. Some of the salts or alkaline earths which are present in the materials, or have been introduced in the molds may be decomposed by the reducing gases. If these gases are not allowed to escape, cavities or blebs are likely to form in the body or glaze. After the glaze has fused, the kiln atmosphere may be maintained in a neutral condition. (5) The finishing period extends from the softening point of cone 8 or 9 to the completion of the burn. Strong reduction is avoided and the atmosphere is maintained as nearly neutral as possible. An excess of 1% carbon monoxide, the exact quantity varying with the nature of the product, is not objectionable. In the burning of porcelain decorated with overglaze or underglaze containing reducible metal oxides, reduction should be followed by re-oxidation of the color oxides. It is important to know the quantity of excess oxygen present in the kiln at the beginning of the sintering of the glaze as a guide in the oxidation. An excess of 1% oxygen is ample for this purpose. C. W. PARMELEE

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38. Joint for articles of ceramic and similar materials and method of producing same. ARTHUR O. AUSTIN. U. S. 1,431,137, Oct. 3, 1922. In combination a plurality of ceram. bodies having surfaces adjacent one another and spaced apart by interposed particles fused to the surfaces to connect the bodies to one another. C. M. S., JR.

39. Spark-plug insulation. T. G. MCDOUGAL. U. S. 1,434,133, Oct. 31. Bentonite 5% or less is used with calcines 60%, china clays 30% and a small amt. of ball clay. (*C. A.*)

Equipment and Apparatus

40. Separation of graphite by froth flotation method. W. GROSS. *Z. angew. Chem.*, **35**, 681.—The crude graphite of Sacrau, Silesia, contains on an av. 31.5% of carbon. The sepn. of this from the associated mineral by the froth flotation method has been investigated on a lab. scale, using machines in which the air to form the froth is drawn in by the rapid agitation of the mixt., and also of the type in which air is forced through a porous bottom. Wood-tar distillates were used as froth promoters. Best results were obtained with "beechwood tar oil No. 3," a heavy distillate, of which 1.49 kg. per T. of crude graphite was used, the mixt. being acidified with 1.23 kg. of sulphuric acid on the same quant. O. P. R. O.

41. Remarkable grinding mill. H. PLAUSON. *Brit. Clayworker*, **31**, 332(1923).—A mill, which can grind materials so fine that they enter into the colloidal state and so remain in suspension for an indefinitely long period, has been invented by Dr. Plauson and is now obtainable in commercial sizes. This "colloid mill" resembles the ordinary disintegrator used for very wet materials, but is driven at a much higher speed (3,000–4,000 r. p. m.). The material to be ground is mixed with 8 or 9 times its wt. of water, and is then passed through the mill, which reduces the solid particles to less than $^1/_{30,000}$ in. in diameter, and as their surface tension is greater than the effect of gravity, they remain in suspension until pptd. by chem. or other agent. This machine is capable of many uses and by its means clays of exceptional fineness can readily be prepd. The ground materials can only be sepd. from the water or other fluid in which they are suspended by passing the mixt. through a special filter. (*Tonindustrie Zeitung.*) O. P. R. O.

42. Development of the filter press. C. L. BRYDEN. *Chem. Age* (N. Y.), **30**, 493–5(1922). E. J. C. (*C. A.*)

43. Standardization of laboratory gas cocks. S. W. PARR. *J. Ind. Eng. Chem.*, **14**, 1105(1922); 3 cuts.—Various objectionable gas cocks now in general use are illustrated and discussed. A working sketch is given of a satisfactory cock to be used by the Univ. of Ill., which specifies optimum length of hose connection and size of corrugations.

The outer edges of the corrugations have slight angles instead of round surfaces, permitting easy slipping on of connection tubing but resistance to its removal.

T. F. B. (*C. A.*)

44. A new instrument for sampling aerial dust. LEONARD GREENBURG AND GEO. W. SMITH. Bur. of Mines, *Repts. of Investigations,* No. **2392,** 3 pp.(1922).—In this new impinger-bubbler type of app. the dust-laden air is caused by a blower to impinge at high velocity on a wetted glass surface, and subsequently to bubble through a liquid medium. The efficiency of the app. tested against tobacco smoke and silica dust, both gravimetrically and by means of the Tyndall effect, is from 9 to 31% higher than that of the sugar tube app. It possesses the additional advantage of low control errors, owing to simplicity of manipulation. T. F. B. (*C. A.*)

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45. Cement mill. ANDREW BERGLUND. U. S. 1,426,812, Aug. 22, 1922. A grinder for a cement mill consisting of a cylindrical body of soft material having longitudinally imbedded therein spaced and relatively thick steel bars exposed through one of the opposed ends of the body, the bars being arranged in spaced concentric circles with respect to the axis of the body of the grinder and in spaced staggered reln. to one an other diametrically of the body. C. M. S., JR.

46. Molding and compacting plastic, fluid, powdered, granular, or the like substances. PETER BURD JAGGER. England. 1,428,097, Sept. 5, 1922. In a shaking or vibratory of a machine for molding and compacting plastic, or fluid, or powdered, granular or the like subs., a main vibratory support, means for imparting movement to the support, a platform on the support, the platform having an independent horizontal vibratory movement on the support, and means for imparting positive and controlled horizontal vibratory movement to the platform relatively to the support and while vibrating therewith. C. M. S., JR.

47. Ceramic press. HARRY D. LILLIBRIDGE. U. S. 1,430,019, Sept. 26, 1922. Pressing mechanism including a compression plunger, a feed nut and a rotative screw whereof the screw is free from endwise or traveling movement and acts by its rotative motion to impart sliding motion to the plunger, and a friction drive, coöperating with the screw for imparting rotative motion only thereto. C. M. S., JR.

48. Apparatus for transporting and unloading brick. WILLIAM J. SULLIVAN. U. S. 1,432,638, Oct. 17, 1922. Brick handling app. of the kind described, comprising a framework adapted to be suspended in balanced relation from an overhead support, a plurality of brick engaging fingers normally extending horizontally and adapted to be the lifting, supporting and carrying devices for handling a plurality of brick in stacked relation, together with means permitting an inclination of the brick engaging devices at any time to afford a gravity discharge of the brick, in combination with means acting on the devices to effect a gradual inclination. C. M. S., JR.

49. Apparatus for dehydrating solid substances. F. MAUS. U. S. 1,418,386, June 6. (*C. A.*)

50. Baffled gas scrubber and fume arrester. E. W. LILJEGRAN. U. S. 1,434,301, Oct. 31. (*C. A.*)

51. Apparatus for electrical precipitation of suspended particles from gases. L. W. CHUBB. U. S. 1,433,699, Oct. 31. (*C. A.*)

Kilns, Furnaces, Fuels, Combustion

52. Kilns. ANON. *Brit. Clayworker,* **31,** 319(1923).—"Is it possible for a given type of product to det. *a priori* the best type of kiln to adopt, giving the maximum calorific efficiency?" is the subject of enquiry by the technical commission of ceramic mfrs.

of France. Conclusions drawn from the enquiry are that accurate technical study of kilns and their working, undertaken systematically by French ceram. mfrs., would prove of vast benefit to the indus. in securing economy of fuel and improved quality of goods. It is estimated that such a study would lead to an economy of at least 3 million f. annually, this being a saving of 10% on the value of 300,000 T. of coal used by the ceram. indus. of France. O. P. R. O.

53. New type of French electric furnace. R. Sylvany. *Iron Age*, **110**, 763–4 (1922).—A new type of elec. furnace developed by T. Levoz was used in France during the war for the production of high speed steels. This furnace is a closed crucible with a single opening for charging, making addns., and pouring. The current enters through a large vertical C electrode in the roof. The horizontal section of this electrode is $^1/_2$ that of the furnace crucible. With d. c. this positive electrode is hollowed out and forms a heat reflector. The bottom electrodes are bundles of Fe wires embedded in the hearth and in the lateral linings of the furnace. The lateral lining presents a larger surface than the bottom of the furnace and permits the no. of embedded Fe wires to be increased and their cross-section decreased. Wires of 6 to 10 mm. in diam. are used. The small section metal conductors produce a more uniform distribution of elec. current and more uniform heating of slag. The lateral electrodes are arranged in two superimposed rows, the lower electrodes for fusion, the upper for refining. Current can be switched from fusion to refining electrodes or taken from both rows at once.

L. J. (*C. A.*)

54. The manufacture of electric furnace steels. Johan Leffler and Assar Groenwall. *Rév. metal.*, **19**, Abs. sec., 413–7(1922).—A brief resumé of the Swedish practice. With the introduction of the elec. furnace in 1910–11, the tonnage has been increased from 132 to 75,684 in ten years. The Groenwall Triphase is a popular design and is used extensively. Analyses of charcoal, furnace gases, slags, Lancashire and Bessemer ores and their products are given. Electrodes are 60–70 cm. in diam. and 2–3 m. long; their consumption varies from 15 to 5 kg./ton of metal, according to quality. The power consumption varies from 2000 to 2700 kw.-hr./ton, the efficiency varying from 83 to 92% and increasing with the number of furnaces operating.

W. A. M. (*C. A.*)

55. Melts gray iron electrically. W. E. Cahill. *Foundry*, **50**, 420–1(1922).—An all-scrap charge was melted and refined on a basic hearth under a reducing slag, in an 800-kw., 3-phase, 2-ton Heroult furnace. Si, Mn, and any other desired addns. are obtained from ferro-alloys. On intermittent operation, single voltage, 893 kw.-hrs. are required per ton of steel, and 784 kw.-hrs. per ton of iron. With dual voltage these figures are reduced to 851 and 709, resp. A high quality gray iron of very fine grain is obtained. S varies between 0.03 and 0.06, and P between 0.2 and 0.5%. Very little hearth repair is required; usually 10–20 lbs. of magnesite will suffice.

W. E. R. (*C. A.*)

56. Air preheating for small industrial furnaces heated with water-gas and with coal. Johs. Schmidt. *Feuerungstechnik*, **11**, 6(1922).—The most that can be saved in this way is less than 12%, which will not pay for the installation. The best means of saving heat is by preheating the charge. E. W. T. (*C. A.*)

57. Pot bank firing with petroleum residues. M. A. Granger. *Oil Eng. Finance*, **2**, 477(1922).—Expts. with a special pottery kiln designed to burn petroleum residues are described. An oxidizing atm. must be maintained and the flame must not be of too high temp. so as to cause over-burning and local fusion. The firings were satisfactory, regulation was easy and the expense equiv. to that of a wood-fired kiln.

D. F. B. (*C. A.*)

58. Comments on the paper of A. von Weinberg: "Heat of combustion and work of

dissociation." WALTER HÜCKEL. *Ber.*, **55B,** 2839–43(1922); cf. *C. A.*, **14,** 1332; **15,** 73.—H. finds at least 6 blunders, contradictions, or similar errors in v. W.'s paper. W. P. W. (*C. A.*)

59. Present status of the electric furnace. J. A. MATHEWS. *Blast Furnace & Steel Plant*, **10,** 542–4(1922). E. J. C. (*C. A.*)

60. Hawley electric furnace. ANON. *Metal Ind.*, **20,** 425(1922).—This furnace is designed for melting non-ferrous metals and alloys. Heat is generated by an arc between two horizontal electrodes and reflected on to the charge. The shell is that of a familiar type of oil-burning brass furnace and permits casting directly or through a ladle. It may be charged in horizontal or vertical position. The shape of the cauldron permits of rigid construction, interlocking lining and uniform heat absorption. An automatic oscillating mechanism is provided for mixing. Furnaces of 600, 1200 and 2500 lb. capacity are to be built but only the 1200 pound (150 kv.-amp.) size is now available. W. E. RUDER (*C. A.*)

61. Pilot-light control for furnace electrodes. C. E. SIMS. *Elec. World*, **80,** 1335(1922); Bur. Mines, *Reports of Investigations*, No. **2411,** 2(Nov., 1922).—Automatic control similar to that of the Hall Al cell is secured for a single-phase elec. furnace by employing two ordinary 40-watt W-filament lamps, set upright on a shelf near the meter board, with each lamp connected to one electrode (or busbar). The lamps have a common connection to the metal bath. The brilliancy of the filament varies with the drop in potential between the electrode and the bath. When the arcs are not the same, the difference is indicated by the lamps and if one electrode touches the bath, its pilot-light is extinguished. For 3-phase operation one more lamp is connected to the third electrode. W. H. B. (*C. A.*)

62. The Fiat electric furnace. A. MARTINAZZOLI. *Elektrotecnica*, **9,** 74–9(1922); *Science Abstracts*, **25B,** 239–41.—The Fiat is a 3-electrode, 3-phase, direct arc furnace, operated on 130 v. during the melting and on 75 v. during refining. Separate doors are provided for charging and pouring. The entire fur. rests on two curved rails which allow it to be tilted by hydraulic pistons. A bridge above the roof and supported from the fur. shell is used for adjusting and replacing electrodes and to support electrode economizers. The form of the latter is characteristic of this type of fur. The economizers are formed by a cylinder sliding inside a bell, the 1st. is fixed on the fur. roof, the 2d. on the electrode. These economizers have reduced electrode consumption to less than 3 kg. per T. of steel. The floor of the fur. is provided with a Cu plate embedded in the refrac. and connected to the center of the secondary star, thus allowing the fur. to be put into opern. with a single arc. The fur. assures making without interruption 150 hts. of 5000 kgs. each. Values for power consumption have been found in practice to be 0.6 to 0.7 kw.-hr. per kg. of steel. Cf. foll. abs. L. J. (*C. A.*)

63. Fiat electric steel furnace. A. STROMBOLI. *Chem. Met. Eng.*, **27,** 28–30 (1922); illus. L. J. (*C. A.*)

64. Status of electric furnaces. L. H. KNAPP. *Elec. World*, **80,** 605–7(1922); 9 illus.—A review. C. G. F. (*C. A.*)

PATENTS

65. Kiln. ROBERT T. KYLE. U. S. 1,426,655, Aug. 22, 1922. A kiln comprising a tunnel, a series of heat inlets opening into the tunnel at horizontally spaced points along one vertical side thereof only, and a single heat outlet from the tunnel, the outlet being located at the opposite side of the tunnel from the heat inlets and being longitudinally spaced from all of the heat inlets and in substantially the same horizontal plane therein, whereby to force the heat from the outlets to travel diagonally across the tunnel and through the ware before escaping through the outlet. C. M. S., JR.

66. Recuperator for glass furnaces and the like. WILLIAM MCLAUGHLIN. U. S. 1,432,706, Oct. 17, 1922. In a glass fur., a melting tank having gas outlet flues along its walls and terminating in a horizontal flue, a chimney into which the ends of the horizontal flue converge, air inlet passages extending through the horizontal flue and spaced from the walls of the flue and placed at the remote ends thereof, the inlet passages and outlet flues being in the same horizontal plane, and burners adjacent the inner ends of the air passages. C. M. S., JR.

67. Coal gas collecting main and ascension pipe. C. V. MCINTIRE. U. S. 1,433,634, Oct. 31. (*C. A.*)

68. Gas producer. J. C. MILLER and A. ISLES. U. S. 1,435,322, Nov. 14. A rotating device is mounted adjacent the inner wall of the producer, to grind clinker formed on or near the wall. (*C. A.*)

69. Reverberatory furnace. A. N. JETTE. U. S. 1,435,304, Nov. 14. A cooling coil protects a feed pipe extending through the furnace roof. (*C. A.*)

70. Kiln for firing pottery and other similar articles. C. F. BAILEY. U. S. 1,434,730, Nov. 7. (*C. A.*)

71. Electric resistance furnace. O. A. COLBY. U. S. 1,435,211, Nov. 14. Overheating of electrodes is prevented by placement of a mass of granular graphite or coke between resistors and electrodes. (*C. A.*)

72. Rotary kiln adapted for roasting boneblack or fuller's earth. F. PEITER. U. S. 1,434,023, Oct. 31. (*C. A.*)

Geology

73. Bauxite deposits in Italy. ANON. *Drug & Chem. Markets*, **12**, 223(1923).—There is every probability that a metallurgical plant will be established in Istria, Italy, where large deposits of bauxite occur. A comprehensive report on these deposits giving analyses of the ores has been made by Consul Haven of Trieste which may be secured from the Bureau of Foreign and Domestic Commerce, Washington. O. P. R. O.

74. Kieselguhr in Chile. ANON. *Jour. Royal Soc. Arts*, **71**, 141(1922).—In Tanca Province, Chile, deposits of high-grade tripoli earth have recently been discovered. A French mining engineer gave as his opinion that the tripoli earth in question was of the best quality and especially fine for glazing china. It may also be used in the manuf. of dynamite. O. P. R. O.

75. Oil shale. W. J. WRIGHT. *Canada Geol. Surv.*, Memoir, **129**(1922).—Bituminous shales in New Brunswick are being seriously investigated, the consensus of opinion of the several geologists who have examined the oil-shale deposits of Albert Mines is briefly that here is sufficient oil-shale to supply a large oil-shale industry for upwards of 100 years. O. P. R. O.

76. Feldspar. A. M. CAMPBELL. *Can. Min. Jour.*, **44**, 112(1923).—New deposit of high-potash feldspar, located near Bathurst, Ontario. Deposits are described. Analysis given: Silica, 65.10%; Ferric oxide, trace; Ferrous oxide, 0.11%; Alumina, 21.50%; Lime, 0.11%; Magnesia, 0.06%; Oxide of potassium, 12.81%; Oxide of sodium, 0.58%. Other analyses show potash, 12.61%, 11.66%, and 12.89%, respectively. Sufficient development work has been done to convince feldspar users that this deposit will supply large amounts of marketable feldspar annually. O. P. R. O.

77. Fluorspar. R. G. CARRUTHERS AND R. W. POCOCK. *Canada Geol. Surv.*, Memoir, 3d ed. (1922).—The British sources of fluorspar are by no means exhausted and not only meet home demands but furnish material for considerable export trade. This report contains notes on all the principal mines in which this mineral has been obtained in Britain, and has been brought up to date by personal inspection of the districts in which fluorspar is produced. O. P. R. O.

78. Saskatchewan clays. W. G. WORCESTER. *Brit. Clayworker*, **31**, 330(1923).—Prof. Worcester predicts early development of the clays of the province of Sask. O. P. R. O.

79. Problems of retarding corrosion. WILDER D. BANCROFT. *Raw Material*, **5**, 267–8(1922).—If a metallic surface is corroded by the corroding medium, the attack must continue so long as the unchanged surface is exposed to the unchanged medium. A cessation of the attack under otherwise changed conditions can occur only when the metallic surface becomes coated with a film which prevents the corroding medium from coming into contact with the metallic surface. The whole problem of retarded corrosion is essentially a question of film formation. E. m. f. measurements are practically valueless. V. O. H. (*C. A.*)

Chemistry and Physics

80. Studies at high temperatures. XV. The vapor pressures of the alkali fluorides. OTTO RUFF, GERHARD SCHMIDT AND SUSANNE MUGDAN. *Z. anorg. allgem. Chem.*, **123**, 83–8(1922); (cf. *C. A.* **16**, 190).—Vapor pressure-temp. curves for the fluorides of Cs, Rb, K, Li and Na are given between pressures of about 50 mm. Hg and 1 atm. The curves are roughly parallel, and the order of metals given above is the order of decreasing vapor pressure at any temp. For any given pressure Rb has a curve about 160° above Cs, K about 80° above Rb, Li about 180° above K, and Na about 30° higher yet. The centigrade boiling points are:

LiF	NaF	KF	RbF	CsF
1670°	1705°	1498°	1408°	1253°

Heats of vaporization, the Ramsay-Young consts., and *critical temps.* (from the Guldberg-Guy rule) are calcd. A. E. S. (*C. A.*)

81. The vapor pressure and sublimation curves for some important metals. J. A. M. VAN LIEMPT. *Z. anorg. allgem. Chem.*, **114**, 105–16(1920).—The formulas deduced in a previous paper (cf. preceding abstr.) are made use of in discussing the vapor pressures and sublimation pressures of the metals W, Pt, Mo, Cu, Sn, Pb, Zn, Ag, Bi, Cd, Sb and Au. (*Ceram. Abs.*, **1** [1], 9(1922).) J. C. S.

82. The National Bureau of Standards. R. S. MCBRIDE. *Chem. Met. Eng.*, **27**, 1159–64(1922).—The organization, functions, personnel, methods and types of work are considered. The relation of industrial research and tech. work to fundamental studies of consts. and research in pure physics is discussed. E. J. C. (*C. A.*)

83. The effect of dissolved substances on the deposition of colloidal particles from a solution by means of an electric current. R. D. KLEEMAN. *Phys. Rev.*, **20**, 272–9 (1922).—Porcelain slip is a colloidal suspension of particles of clay, flint, and feldspar in water (= 70%). When the solid matter is deposited in a mold by electricity a creamy layer forms. If a small amt. (0.1 to 0.3%) of Na_2SiO_3, Na_2SO_4, Na_3PO_4, Na_2HPO_4, H tartrate, Na tartrate, NaOH, or KOH is added to the suspension, a slight pptn. occurs immediately and a gradual process of pptn. (of flint and feldspar esp.) goes on. If more of the clay-flint-feldspar mixt. is added and the mixt. is agitated, the pptd. material redissolves. It requires 60% solid matter to produce the same fluidity which 30% solid matter had previously produced. Elec. deposition from this suspension will give solid deposits instead of semi-liquid ones. An increase in the amt. of the substance added to the slip increases both the fluidity of the suspension and the compactness of the deposit, but successive equal additions are decreasingly effective. Both of these effects are ascribed to a decrease in vol. of the sphere of action of the colloidal particles. This decrease in vol. is due to the influence of the small amt. of substance added to the slip. Since the second deposit is solid it is assumed that the spheres of influence of its

particles are not much larger than the particles. In the untreated slip the sphere of influence must be at least twice the size of the particles. With clay alone, the apparent sphere of action is 3 times the vol. of the particle. Colloidal particles remain in soln. if they sep. after collision, and ppt. if they do not. The forces which cause attraction or repulsion can be expressed in terms of interfacial surface tension. The distribution of particles under the action of gravity is calcd. and expressed mathematically.

F. E. B. (*C. A.*)

84. Losses on ignition and porosity of kaolins, clays, bauxites, etc. A. Bigot. *Compt. rend.*, **174,** 1232–5(1922); cf. *Jour. Amer. Ceram. Soc.*, **5** [12], 1005(1921).—Bauxite in its natural state does not disintegrate in H_2O, but kaolin and clays do, regardless of whether in the natural state, or after grinding and compressing. The porosity of the test specimens (ground to 200 mesh, moistened and briquetted at 377 kg. sq. cm.) was detd. by the hydrostatic balance method—using a mineral oil of known d. instead of H_2O. The samples were immersed in oil for several hrs., under a bell jar from which the air had been evacuated, to avoid errors due to occluded air. The expts. indicate two new observations: (1) Clays, kaolins, and bauxites which contain more than 14% combined H_2O lose most of it around 300° and before 600°. (2) These substances, which are plastic to varying degrees, harden around 400° before normal dehydration and become agglomerated, and they do not disintegrate in cold or boiling H_2O, or in acid or alk. solns.

A. R. A. (*C. A.*)

85. The plant manager and the chemist. M. L. Griffin. *J. Ind. Eng. Chem.*, **14,** 985(1922); cf. *C. A.*, **16,** 2562.

E. J. C. (*C. A.*)

86. Method of calculating fluidity, surface tension, and reaction (equilibrium) pressure. H. J. M. Creighton. *J. Frank. Inst.*, **193,** 647–55(1922).—By means of an expression precisely similar to the vapor pressure equation of Ramsay and Young, it is possible to calc. the fluidity or viscosity of liquids, the equil. pressure of chem. reactions, and probably the surface tension of liquids. Agreement between calcd. and observed data indicates that the values obtained by this method represent a close approximation to the true values. "The utility of the expression $R' = R + c(T'_B - T_B)$ is evident, for if values of one of the physical consts. are known over a wide range of temps. for one substance (B), and if the value of the const. is detd. at a few temps. for a second substance (A), then its value for the latter can be calcd. over a range corresponding to the range of the known values for the first substance (B). To do this, the values of the ratio $T'_A/T'_B = R$ are plotted against the abs. temps. T'_B, and a straight line drawn through the points. By multiplying a particular temp., T'_B, by the corresponding temp. ratio (read off from the curve), the abs. temp., T'_A, is obtained at which the value of the physical const. of the substance A is equal to that of the substance B at the abs. temp. T'_B. If the line does not run through the points (*i. e.*, if c is not const.), it is probable that the exptl. data are not accurate, or that one of the substances behaves abnormally.

J. S. H. (*C. A.*)

87. Silicates of strontium and barium. Pentti Eskola. *Am. J. Sci.*, **4,** 331–75 (1922).—Considering the wide occurrence of isomorphous sulfates and carbonates of Ca, Sr and Ba, the question rises: Do Sr and Ba under exptl. conditions form such silicates as are known in the case of Ca? For this study the purest SiO_2, Ca, Sr and Ba carbonates obtainable were used. These substances were dried at 150°, weighed, mixed, melted if possible, chilled and crushed, then reheated and ground twice more. The equil. relations were ascertained by the quenching method. Heating curves were run in some cases for the purpose of checking the temp. measurements. Temps. were detd. by a potentiometer and a thermoelement calibrated against the m. p. of diopside and anorthite. Refractive indices were detd. by the improved immersion method of Merwin. The systems $SrO.SiO_2$, $BaO.SiO_2$, $CaO.SiO_2$–$SrO.SiO_2$ and $CaO.SiO_2$–BaO.-

SiO_2 were worked out and the results collected in 12 tables and 12 charts of curves. Crystallographic features are shown in 5 illustrations. Sr and Ba feldspars were found to be analogous to anorthite. L. W. R. (*C. A.*)

General

88. Annual report of the director of the Bureau of Standards, 1922. S. W. Stratton.—The outstanding feature of the fiscal year ended June 30, 1922, as far as the Bureau of Standards of the Department of Commerce is concerned, was the great amount of attention paid to industrial standardization, to the elimination of waste in the industries, and to the simplification of industrial products. New and important work undertaken during the year was that in connection with building and housing. H. F. Staley

89. Porcelain bells in Germany. *Zeit. für Instrumentenbau*, January(1923).—The State Porcelain Manufactory at Meissen has succeeded, after repeated experiments, in mfg. a set of chimes of fifty bells, of which the tallest is some 5 ft.; the chime is intended for the use of the Town Church. The tone of the bells, which are tuned after firing, is stated to be remarkably soft and mellow. O. P. R. O.

90. New vacuum drying plant. Anon. *Chem. Trade J.*, **71**, 451–2(1922).—A description of a new type of vacuum drier installed at the works of the *Soc. matieres colorantes et prods. chim St. Denis*. It consists of an air-tight drying chamber contg. trays, a barometric condenser, a Delas steam jet air extractor for maintaining a vacuum in the condenser and drying chamber. This jet discharges into the steam space of the drier and thereby furnishes the heat for drying. The nozzle is simpler and requires less attention and repairs than a vacuum pump. In every case the actual economy is above 50%. L. A. P. (*C. A.*)

PATENTS

91. Damproofing concrete body. Frederick G. Jordon. U. S. 1,429,740, Sept. 19, 1922. A damp-proof concrete body, comprising a plurality of perforated sheets embedded in such body, with a bonding strata of cementitious material therebetween, the sheet having alternate openings of the strata, and solid portions of greater area than the openings, the sheets having such relative arrangement as to locate the openings of one sheet centrally opposite the solid portions of the adjacent sheet. C. M. S., Jr.

BOOK REVIEWS

Chelsea Porcelain. William King. Published by Charles Scribner's Sons. New York. 1922. $20.

With the present pedagogical and industrial interest in ceramic art development comes specialized and general literature according to past achievements, present activities and future possibilities. The latter invariably closely follows the former.

While the potter himself (meaning the manufacturer, plant official and active worker) has not to date followed closely enough the ceramic literature of his day, there have always been enough interested outsiders or "laymen" to tempt the publisher to speculate on occasional ventures in the ceramic field.

Were it not for this fact, the printed information available to the ceramic student would be meager indeed. Then again, the potter himself is not particularly conspicuous as an author; except for the works of Solon, Burton, Binns and a very few others, the potter has been strangely silent. He is perhaps too much occupied and absorbed in his own field, or he is or has been more or less inarticulate and uncommunicative.

If the present day scientific and technical organizations had existed in the various countries during their highest periods of ceramic development, we would

no doubt have some wonderful practical records in addition to the existing historical data.

Data, however, is so conglomerate, general, and often so unreliable and unauthentic that the selection of a reliable work on a practical subject is an extremely uncertain proposition.

This may be good reason why the potter as a rule is not a heavy purchaser of ceramic literature. The conjectural musings of the ceramic historian are not only unconvincing, they are often ridiculous from a practical point of view. And the clay worker is essentially a practical individual with little patience for romantic theories, no matter how enthusiastic the author might be.

Plate painted in the style of Kakiemon. (Collection of Dr. and Mrs. Bellamy Gardner.)

However, when an authoritative and comprehensive work does appear, it is worth the attention of any ceramist interested in the subject. "Chelsea Porcelain" by William King of the Victoria & Albert Museum is such a work. It adequately but concisely covers the field previous to the founding of the Chelsea Factory about 1745, and then outlines the subsequent developments so far as they are known.

While Mr. King is authority enough for the conclusions arrived at, every source of information is included. To one not familiar with the history of the activity (so far as this is known), this consistent inclusion of references is likely to make the work rather difficult to read. But this should not detract from the interest or value of the book.

The close descriptive detail of the various examples and the consistently pieced together historical evidence represents an enormous amount of patience and interested labor, which will perhaps be appreciated more by the collector and historical student than by the practical potter.

FIG. 1.—Pilgrim bottle of grey stoneware with olive-brown glaze, decorated in high relief showing Hellenistic influence, T'ang Dynasty (in the Victoria and Albert Museum).

FIG. 2.—Caparisoned horse pawing the ground, hollow body made of buff pottery, yellow glaze, T'ang Dynasty (in the Benson Collection).

The chief value of this book to the manufacturer and the ceramic decorator lies in the illustrations which are large and clearly enough reproduced to give an excellent idea of the texture and technique of the example shown. There are one hundred and seventy odd illustrations (a few in color) of clocks, candlesticks, plates, teapots, cups, pitchers, trays, dishes, perfume bottles, figurines and all the various bric-à-brac popular about the time of George III.

The book is an amazingly fine record of an activity about which too little is known. It should be a welcome addition to the factory library where it will be a valuable reference and inspiration to the potter and decorator.

FREDERICK H. RHEAD

The Early Ceramic Wares of China. A. L. HETHERINGTON. Published by Charles Scribner's Sons. New York. 1922. $20.00.

A companion volume to "Chelsea Porcelain" by William King. An able historical account of the pre-Ming wares in which is included an unusually interesting and authoritative description of the technique of the Sung and Yuan wares. (Chapter IX.)

The notes on copper reds will be read with keen appreciation by the practical potter interested in such types.

As the author states in his preface, the illustrations are for the most part selected from good specimens in private collections. This is a good plan because the average student may readily see museum specimens while the private collection is not often available.

The potter will find much more technical and practical information in this book than is found in most historical accounts of ceramic development. The book is a fit companion to "Chelsea Porcelain" and an essential to the library of the up-to-date potter and manufacturer.

FREDERICK H. RHEAD

Grundzüge der Keramik. By Dr. W. Pukall. Verlag von Müller & Schmidt, Coburg. 1922. 187 pp.

Grundzüge der Keramik is a text-book on ceramic subject matter. The treatment is of a general nature and given from a practical viewpoint; but considered in the light of chemical relations.

In an introductory section, a classification of clay products is outlined, of which the main divisions are: (1) earthenware, (2) stoneware, (3) whiteware, and (4) porcelain. Following a general section treating of raw ceramic materials, and of common tests for these, the text takes up the subject matter under the four divisions named above.

The raw materials are considered as (1) plastics, (2) non-plastics, and (3) auxiliaries, such as gypsum, coal, etc. The tests are classified as (1) preliminary and (2) special, or exact. Interpretation of results of examination of elutriation residue are given, and conclusions drawn from results of burning raw test pieces to various temperatures. The method of calculation from weight to volume basis is shown. For further calculations, reference is made to the book on Ceramic Calculations written by the author.

In discussion of earthenware products, types of glazed and unglazed wares are considered, also glazes, methods of glazing and decorating, and the process of burning. Similar treatment of stoneware products is given, but including a discussion of crystalline and decorated crazed glazes. Whiteware products are treated more at length, and problems of preparation and burning are fully treated. Porcelains are discussed as to types, constituent raw materials, preparation, glazing, and decoration. Basic glaze formulae are given, and also effects and strength of colorants. Formulae for different colored glazes and enamels, and for rare metal colors and lusters are given.

E. E. Pressler

COMPILATION OF DATA, BIBLIOGRAPHIES AND ABSTRACTS

The Society is engaged in the compilation of data and bibliographies which are of direct value to ceramic manufacturers and technologists. Abstracts of the world's literature on given subjects are being assembled which will serve as reviews of all the knowledge extant on those subjects. New methods, processes and materials are being investigated.

This is the comprehensive service which the American Ceramic Society is rendering the ceramic industries.

Through the committees of the Industrial Divisions the work of the Society is made practical and timely. The problems and needs of each industry are known because the officers and committeemen of the Divisions are, for the most part, in the factories.

With the several Divisions collaborating through the central committees each using the same media for exchange of knowledge, the Society brings to the solution of the several problems which are common to more than one industry, all the knowledge that applies. In this lies the value of all the ceramic industries joining in the support of this, the only organization devoted exclusively to the promotion of the technical, scientific and artistic interests of the ceramic industries.

The "Collective Index" of papers on Vitreous Enamels, compiled and edited by R. R. Danielson and T. D. Hartshorn of the Enamel Division may be had free upon application to the Secretary's Office.

The "Collective Index" to the first nineteen volumes of the *Transactions of the American Ceramic Society* is also available. Price $1.50.

CERAMIC ABSTRACTS

Compiled by the

AMERICAN CERAMIC SOCIETY

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Abrasives

1. The manufacture of aluminium in Russia. S. D. Chéine. *Communications travaux tech. sci. effectués Republique Russe*, **5**, 71–3(1921); *Rev. métal.*, **19**, 568–9 (Abs.) (1922).—B. J. Zbarsky has worked out a method for the com. sepn. of Fe salts from a soln. of $Al_2(SO_4)_3$, which allows of working kaolins by the so-called acid process for the production of Al. Kouznietsoff and E. J. Joukovsky treat a mixt. of Al ore, baryta (or $BaCO_3$) and Fe scrap in an elec. furnace, obtaining products such as ferro-Si and Ba aluminate (the latter in the form of a slag). The Ba aluminate is dissolved in water, and the Al is prepd. by one of the usual methods and the recovered Ba is re-used. This process is suitable for the Tikhvine bauxites, which contain large amts. of SiO_2 and of Fe and which could supply the whole Russian requirements of ferro-Si. A. P.-C. (*C. A.*)

2. Improvement of emery papers. Carl Benedicks and Erik Sörberg. *Z. Metallkunde*, **14**, 397–9(1922).—Ordinary fine-sized emery paper is fastened to a coarse book-binding paper under pressure so as to provide furrows which will care for the sepd. emery particles and prevent excessive scratching. Photomicrographs show steel samples polished with ordinary and improved paper. W. A. M. (*C. A.*)

Cement Lime and Plaster

3. Tentative methods of testing gypsum and gypsum products. Anon. *A. S. T. M. Tent. Stand.*, 307, **1922.**—Detailed chem. methods are given for the detn. of free and combined H_2O, CO_2, SiO_2, Fe_2O_3, Al_2O_3, CaO, MgO, SO_3, NaCl. Physical tests include detn. of fineness, consistency, H_2O carrying capacity, dry bulk, wet bulk, time of setting, tensile and compressive strength, and sand carrying capacity. E. N. Bunting

4. Tentative definitions of terms relating to the gypsum industry. Anon. *A. S. T. M. Tent. Stand.*, 320, **1922.**—The following are defined: accelerator, aggregate, binder, cement, consistency, lath, mortar, plaster, plasticity, retarder, stucco, and wood fiber. E. N. B.

5. Tentative methods of making compression tests of concrete. Anon. *A. S. T. M. Tent. Stand.*, 299, **1922.**—Detailed instructions are given for this test. E. N. B.

6. Tentative specifications for gypsum. Anon. *A. S. T. M. Tent. Stand.*, 268, **1922.**—Includes: I. Materials and Standards. II. Sampling. III. Packing and Marking. IV. Inspection. E. N. B.

7. Tentative specifications and tests for compressive strength of Portland cement mortars. Anon. *A. S. T. M. Tent. Stand.*, 229, **1922.**—Compress. strength in lbs. per sq. in. should = 1200 after 7 and 2000 after 28 days. Test piece should be in form of cylinder 2″ diam. x 4″ length molded from non-corroding molds. Any calibrated testing machine may be used. Samples differing $> 15\%$ from av. should not be considered in detg. compress. strength. E. N. B.

8. Tentative specifications for concrete aggregate. Anon. *A. S. T. M. Tent. Stand.*, 259, **1922.**—Sieve tests, strength tests and color test are covered. E. N. B.

9. Tentative specifications for quicklime and hydrated lime for the manufacture of silica brick. ANON. *A. S. T. M. Tent. Stand.*, 257, **1922.**—Chem. compn. requirements and sampling methods are given. Min. CaO content is 92% and max. MgO 3%. E. N. B.

10. Tentative methods of chemical analysis of limestone, quicklime and hydrated lime. ANON. *A. S. T. M. Tent. Stand.*, 277, **1922.**—Details are given for estimation of SiO_2, Fe_2O_3, Al_2O_3, CaO, MgO, SrO, volatile matter, H_2O, CO_2, SO_2, total S, phosphorus, manganese, available lime. E. N. B.

11. Characteristics for the evaluation of limestone, dolomite and similar carbonate rocks and a rapid method for analyzing the same. A. DESGRAZ. *Z. angew. Chem.*, **35,** 714–5(1922).—The attempt is often made to judge a limestone by measuring the vol. of CO_2 evolved on treatment with an acid or by the loss on ignition but these tests often lead to erroneous conclusions. Sometimes an impure $MgCO_3$ will give the same CO_2 content as a pure $CaCO_3$ and often substances are present which lose water on ignition. The loss on ignition together with the behavior on slaking gives a better characterization. A pure calcite will give 41–44% loss on ignition, will slake rapidly and give a white oxide. A dolomite will give higher loss on ignition and a more grayish oxide which will not slake as readily. Calcite contaminated with much Fe and Al will show a lower loss on ignition and a yellowish oxide. The following very rapid method of analysis gives excellent values for CaO and MgO. Dry the sample at 110° and heat 1 g. to const. wt. at 930–950° to get the loss on ignition. Slake the residue with a few drops of water and transfer to a 150-cc. beaker. Boil with 30 cc. of a concd. soln. of NH_4Cl until no more NH_3 is evolved; this shows that all of the Ca and Mg has dissolved as chloride. Filter into a 500-cc. calibrated flask, ignite and weigh the residue of Al_2O_3, Fe_2O_3, Mn_3O_4 and SiO_2. In 100 cc. of the soln. det. the Ca by pptn. with $(NH_4)_2C_2O_4$ in the usual way. In another 100 cc. of the chloride soln. det. Mg without removing Ca by adding 10 cc. of 10% citric acid soln., 50 cc. of concd. NH_4OH and 30 cc. of 0.5% $(NH_4)_2HPO_4$ at 80°. Cool with running water, filter, wash with 2.5% NH_3 soln., ignite and weigh as $Mg_2P_2O_7$. W. T. H. (*C. A.*)

12. Aluminous cement. BIED. *Rev. univ. mines*, July, **1922**; *Technique moderne*, **14,** 508–9(1922).—Aluminous cements are cements with a high Al_2O_3 content, known commercially as "fused," "elec.," or "electro-fused" cement, in which the Al_2O_3 content is equal to or greater than the SiO_2 content. They are produced by fusion because Ca aluminates do not soften and clinkering is very difficult. Methods of manuf. are described. The compn. is about: SiO_2 10–12, Al_2O_3 40–45, CaO 35–40, FeO 15–20%. Setting starts in about 4 hrs., and is complete in 7–8 hrs. Hardening is very rapid and an ordinary concrete (800 l. gravel, 400 l. sand, 350 kg. cement) has a min. strength of 300 kg. per cm.^{2} in 72 hrs., which is much higher than the strength of Portland cements after 90 days. Also in *Rev. metal.*, **19,** 759–64(1922). A. P.-C. (*C. A.*)

13. Caustic magnesia cement. ANON. Bur. of Standards, *Circ.* **135,** 1–14 (1922).—General information concerning this type of cement is given, including discovery, early history, methods of manuf., and use for flooring, stucco, and ship decking. Considerable confusion has arisen because of the variety of names under which the material has been sold and variations in its quality and behavior. Recently a committee representing a Western organization of producers and two of the Federal bureaus has been organized to write specifications. Color, fineness, time of set, modulus of rupture, and constancy of vol. are being considered. Chem. requirements have been omitted. J. C. W. (*C. A.*)

BOOKS

14. Manufacture of Portland Cement. ARTHUR C. DAVIS. 3rd Ed. Revised and enlarged. Dublin: J. Falconer. 429 pp. 25s. (*C. A.*)

15. Cements and Artificial Stone. J. WATSON. Edited by R. H. RASTALL. Cambridge: W. Heffer & Sons, Ltd. 131 pp. 6s. (*C. A.*)

16. Cements, Limes and Plasters. EDWIN C. ECKEL. 2nd Ed. Revised and enlarged. New York: John Wiley & Sons. $6.50. Reviewed in *Eng. Mining J.-Press.*, **114,** 1126(1922). (*C. A.*)

Glass

17. Glass-making sand. (New Zealand.) ANON. *Raw Mat. Rev.*, **2,** 93(1923).—Deposits have recently been discovered by accident at Mount Somers, Canterbury. Prospecting had been in progress for about 12 mos., with a view to locating coal seams within easy access of the Gov't railways. After a 7-ft. drive had been made to a length of 400 ft., it was proved beyond doubt that an immense body of silica was present. Analysis shows that the sand is almost pure silica, containing no less than 99 per cent, a percentage never recorded before in any part of the world. Experts from glass-mfg. concerns have also examnd. the sand, and declare it to be the finest they have seen. O. P. R. O.

18. Pyrex glass. ANON. *Chem. Zeit.*, May 25, **1922.**—Pyrex glass is remarkably resistant to changes of temp., and may be used over an open fire. Expts. show that ordinary heating is not sufficient to melt the materials for such a glass, and a special furnace, possibly with surface combustion is required. Chem. compn. of Pyrex: Silica, 80.71; boric anhydride (B_2O_3), 10.47; alumina, 3.55; lime, 0.70; magnesia, 0.57; soda (Na_2O), 4.14. The low alkali content is noteworthy. O. P. R. O.

19. Glass and metal. W. E. S. TURNER. *Metal Ind.* (London), **22,** 128(1923).—Glass manuf. processes were contrasted with those in steel manuf. in a lecture given by Mr. Turner to the Sheffield Association of Metallurgists and Metallurgical Chemists, "Some Problems Common to the Study of Glass and Metals." Furnaces are similar, except that in the glass furnace the great desideratum is an oxidizing atm., while in the metal furnace it is a reducing atm. The conditions of working out are different in that the plastic glass can be worked direct into the article required and is not cast in ingot form, except in optical glass, and even then the glass is not teemed. The study of glass might assist in a number of interesting problems connected with hardening of metals. The cryst. forms of silicates have a distinctly different sp. ht., d., hardness and other properties from vitreous, and Mr. Turner suggested points of value in this connection. He further contrasted corrosion of glass and metals, and pointed out that a surface like glass appeared not to be homogeneous when subjected to chem. agents. O. P. R. O.

20. Use of the autoclave method in testing glassware. W. L. BAILLIE. *Glass Worker,* **42** [17], 13(1923). (From *Pottery Gazette and Trade Rev.*)—The autoclave test is reliable and expeditious, and its acceptance as a standard is urged. Three tests of increasing severity are 2 hours at 30 lbs., per sq. in., 3 hours at 50 lbs., 3 hours at 90 lbs. Should be made on finished piece and not on ground glass. The criteria of durability are alkalinity, clouding or superficial disintegration and the amount of residue on evaporation. R. J. MONTGOMERY

21. Some criticism of the use of the autoclave as a method of testing glassware. W. H. WITHEY. *Glass Worker,* **42** [17], 13(1923) (From *Pottery Gazette* and *Glass Trade Rev.*)—Tests on a zinc and a lime borosilicate glass showed inaccurate results, because the lime glass developed a protective coat on its surface which retarded action. The zinc glass did not do this. R. J. M.

22. Some difficulties of the interpretation of autoclave results. W. E. S. TURNER AND F. W. HODKINS. *Glass Worker,* **42** [17], 13(1923). (From *Pottery Gazette and Glass Trade Rev.*)—Results of test made at over 60 lbs. pressure are hard to interpret. As a

test for optical glass, the autoclave was insufficient as results were misleading. The boiling water test on crushed glass is as good and much more simple. R. J. M.

23. Chemical deposition of silver on mirrors. ALBERT S. CARTER. *Glass Worker*, **42** [18], 13(1923). (From the *Carnegie Technical, Jr.*)—Electroplating is satisfactory for metallic mirrors but not for glass. Chloride electrolyte is 3780 grs. H_2O, 85 grs. AgCl, 226 grs. NaOH or KOH, potential $^1/_2$ volt. Nitrate electrolyte, 100 grs. H_2O, 3 grs. $AgNO_3$, 3 grs. HNO_3, 3 grs. $C_4H_4O_6H_2$, 2 grs. $Fe(NO_3)_3$, potential 1 to $1^1/_2$ volts. Careful cleaning of the surface is necessary. A variation of the Edel process and the Brashear process are given for chemical deposition of silver. Various solutions and methods are given. R. J. M.

24. Decorated glass beads. ANON. *Schnurpfeil's Rev. for Glass Works.*, **6** [69], 1407 and **7** [70], 1439.—Descriptive article on bead making in Bohemia. Method of making and decorating is given for Coupé, Rocaillis, Macca and Thuringan types. R. J. M.

25. British glass industry; its development and outlook. W. E. S. TURNER. *J. Soc. Glass Tech.*, **6**, 108–46(1922).—Presidential address, containing an acct. of the history of the industry with statistics as to number of factories, workmen, production, exports, imports, etc. The British industry was an off-shoot of the continental and amounted to little until fostered by monopolies granted by Queen Elizabeth. In spite of oppressive taxation and regulation up to 1845, the century after 1775 was a prosperous one for the industry which reached the culminating point in 1874. Then until 1914 it struggled along under the handicaps of foreign protective legislation and foreign competition. The War, of course, forced the production of optical, chemical, and other glassware, previously almost entirely imported, and left the industry much better equipped than before. To England belongs the credit for first substituting coal for wood, for introducing covered pots, annealing in leers, open and shut molds, for discovering lead glass, and for developing the first bottle machine. Recently the industry has been revolutionized by the introduction of semi-automatic and automatic machines, largely American, and by the substitution of scientific for rule of thumb methods. Trained chemists and engineers are now being employed, research institutes have been established and a scientific Society with nearly 700 members has grown up. It is pointed out that future prosperity depends on stimulating the home market, extending the use of glass for containers, cooking, etc. The address closes with an eloquent description of the industry as a growing lad, dependent on its own energy and enterprise, lacking experience and confidence, needing criticism and help, but with no small latent power. G. F. FULCHER

26. Problems in the melting of glass II. (Discussion.) *J. Soc. Glass Tech.*, **6**, 147–56(1922).—(1) *Best ratio of cullet to batch.* When batch alone is used, the glass takes longer to plain and is also somewhat softer. It may contain very fine seed which affects its working properties. The cullet contains more iron and more alumina than the batch, therefore makes the glass more colored and more viscous, but it helps in plaining. Practice varies widely, depending largely on the amount of cullet available. In the case of tank furnaces, the important thing is to keep the ratio constant so that the properties of the glass will not change. (2) *Salt-cake vs. soda-ash in soda-lime glass batches.* Although no scientific explanation is at present available, it is a matter of experience that glass made from batch containing salt-cake is easier to work, and apparently has a longer viscosity range than if soda-ash alone is used. It was suggested that this is due to greater homogeneity. It is American practice in making window glass to use 1 part salt-cake to 2 parts soda-ash. However, the salt-cake is more corrosive of the refractories and sometimes gives a bluish green color. (3) *Advantages of thoroughly mixing batch and cullet* were pointed out, to insure homogeneity of the glass. (4) *Equipment needed for control of window glass tank* is listed. G. F. FULCHER

27. Columnar structure in sandstone tank blocks after rapid heating and cooling. JOHN CURRIE. *J. Soc. Glass Tech.*, **6**, 156–60(1922).—Blocks forming the lower course of the walls of a green bottle glass tank, became rapidly heated from about 800° to 1300° during the draining of the tank and were then rapidly cooled. They were found to show a columnar structure normal to the cooling planes, similar to that of basaltic columns. Four photographs are reproduced. G. F. FULCHER

28. Medieval glass of York Minster. W. FOXLEY NORRIS. *J. Soc. Glass Tech.*, **6**, 160–7(1922).—York Minster contains 109 windows with over 25,000 square feet of English glass of the 13th, 14th and 15th centuries. During the War, 23 windows were removed for preservation against destruction by raids, and it was then found that the windows were in a dangerous condition because of the disintegration of the lead, and also that the glass seemed to be diseased, many pieces being badly pitted and some having scaled off until they were paper thin; others had crumpled to dust. The windows were being gradually cleaned and releaded, the mellowing effect of centuries of dirt being removed but the original brilliancy being restored. W. E. S. Turner explained the disease as due to a *gradual hydration of the glass*, which was doubtless a lime glass made from French sand with perhaps not much alumina. G. F. FULCHER

29. Production of colorless glass in tank furnaces, with particular reference to the use of selenium. Part I. A. COUSEN AND W. E. S. TURNER. *J. Soc. Glass Tech.*, **6**, 168–81(1922).—A large number of small scale melts of a simple soda-lime-glass made with soda-ash showed that if the iron content is .09% or less, a colorless glass may be produced by adding .003% of selenium together with .0005% cobalt oxide. However, with even a small amount of salt-cake in the batch an increased amount of selenium was required. The salt-cake seems to react with selenium at high temperatures, producing sodium selenite, and it also tends to increase the iron content by corrosive action on the pot or tank walls. With batches containing soda-ash only, sodium selenite is about ten times more effective in decolorizing action than elementary selenium but this is not true of batches containing salt-cake. Reheating, and presumably annealing, decolorized glass does not introduce color, but over-decolorized glasses may have the amber tint deepened by heating at 525–575°. Further experiments are proceeding to determine more definitely the relative value of selenium and of sodium selenite as decolorizers and also the influence of reducing agents, including white arsenic.

30. Critical review of the provisional specifications for glass refractory materials. W. J. REES. *J. Soc. Glass Tech.*, **6**, 181–204(1922).—(1) *Silica brick.* For bricks to be used in such positions as furnace pillars, it might be well to specify a powder density of 2.35 so as to insure at least 80% conversion into tridymite; but for bricks to be used in crowns such a stipulation may not be necessary or desirable. A specification as to mechanical strength would be desirable. It was pointed out that exposure to a moist atmosphere diminishes the mechanical strength markedly. Special specifications for bricks to be used in regenerator chambers are also needed. (2) *Tank blocks.* There is great need for more information as to the causes of block failure, whether due to the particular melting conditions or to the materials or manufacture of the block. In some tanks the corrosion is not greatest at the metal line but may be worse on the lower blocks, due probably to mechanical corrosion. Tanks should always be raised to a high temperature before the filling is begun. The two most important factors governing the life of a block are porosity and uniformity of texture. Results of tests of 8 makes showed that the two blocks with porosity of only 21 and 19% and with after-contraction of only 1.4 and 0.8% gave the best service, one lasting 18 months in a tank furnace melting a salt-cake batch. The grog should be of the same clay or at least have the same solubility as the rest of the block. Perhaps unweathered clay would be better than weathered clay. Methods of test are discussed. A small special tank seems best. The practical

difficulties of producing uniform blocks are very great. Coöperation between block makers and users is necessary for best progress. In the discussion, it was suggested that since small blocks are more easily made uniform than larger ones, they should be tried. (3) *Pot clays.* The specifications are decidedly debatable. Though there is a tendency to use aluminous clays, siliceous clays give greater strength and show less shrinkage. G. S. F.

31. Manufacture and properties of oven glass. R. F. Brenner. *Glass Ind.*, **4,** 23–4(1923).—Glass to be satisfactory as a material for ovenware, must have high thermal endurance, high chem. stability, high mech. strength, and good workability. The various oxides exert a favorable influence on the important properties in the following order, the best coming first: Tensile strength—ZnO, SiO_2, P_2O_5, B_2O_3, BaO, Al_2O_3, As_2O_3, PbO, Na_2O, K_2O; expansion—B_2O_3, MgO, SiO_2, ZnO, P_2O_5, As_2O_5, PbO, BaO, Al_2O_3, CaO, K_2O, N_2O; elasticity—MgO, As_2O_5, B_2O_3, SiO_2, BaO, CaO, K_2O, Na_2O, ZnO, Al_2O_3. Stability is high for borosilicate glasses of low alkali and high silica content, especially when containing alumina. While low expansion is desirable, the other factors must also be considered. G. S. F.

32. Making of watch crystals. W. H. Holmes. *Glass Ind.*, **4,** 25–28(1923).—When the war stopped the importation of crystals, the Waterbury Watch Company undertook to make their own and gradually developed a plant which now has a capacity of over 100,000 crystals a day. A lead glass batch made with crushed silicate rock, is melted in covered 2400 lb. pots and then blown off-hand, without molds but with compressed air, to spherical globes, 10 to 12″ in diameter. These are split, then circular blanks are cut out, inspected, graded, reheated if necessary to level the edges, then the edges are ground and polished by semi-automatic machines. Higher grade crystals are specially shaped, ground and polished. G. S. F.

33. Operating continuous glass furnaces with fuel oil. W. G. Edmonds. *Glass Ind.*, **4,** 29(1923).—A discussion of the relative cost of coal and fuel oil, with suggestions as to the storage of the oil and the operation of the oil burners. G. S. F.

34. Glass manufacture with the electric radiation furnace. V. M. Sauvageon. *Glass Ind.*, **4,** 30–1(1923). Trans. of *Chimie et Industrie,* **7,** 452–5(1922).—(See *Ceram. Abs.*, **1** [9], 82(1922). G. S. F.

35. Making glass for Ford windshields. Fred S. Huntley. *Glass Ind.*, **4,** 1–5 (1923).—Illustrated description of the one furnace plant at Highland Park which is at present supplying 7 per cent of the Ford windshields required. The soda lime glass flows continuously on to a moving table which takes it under nichrome rolls and then through a 442 ft. leer. After cutting, each plate is embedded in plaster of Paris (mixed continuously in a special machine) and carried in succession under seven sand grinders, five emery grinders and a rouge polisher. The other side is then polished in the same way. Experiments to produce windshields without polishing were carried on for two years but finally given up. Construction of a four-furnace plant at River Range has just begun. G. S. F.

36. Use of fuel oil for finishing glassware. W. S. Edmonds. *Glass Ind.*, **4,** 4–5(1923).—Some suggestions for the use of oil burners in glory holes. A dry flame should be used so that carbon may give a polish to the glass. The burner should be placed in the center of the bottom and only sufficient draft used to show a little white smoke leaving the stack. G. S. F.

37. Burnt lime or limestone in glass batches. Irving E. Adams. *Glass Ind.*, **4,** 5(1923).—Comparative runs are cited which indicate that while coarsely crushed high magnesia limestone tends to give seedy glass, burnt lime is no better than finely ground limestone. Practice at present varies, burnt lime being used for bottles, tumblers, lamp chimneys, etc., while limestone is used for fruit jars and window glass. The *value*

of salt cake, 60 or 70 lbs. per batch, over straight soda-ash charge in accelerating plaining, is confirmed by a test. G. S. F.

38. Modern glass factory equipment. W. S. MAYERS. *Glass Ind.*, **4**, 7–8(1923).—Brief discussion of modern equipment for storing and handling raw materials, for mixing the batch and for conveying it to the furnace bins. The arrangement in which the batch car runs under the storage bins and discharges into an elevating and conveying system extending to the furnace bins is the most flexible. To avoid sepn. of fine and coarse materials in the furnace bin, a special design is suggested which provides plates to divide the bin into narrow vertical shutes. See *Ceram. Abs.*, **2** [2], 31(1923). G. S. F.

39. Notes on glass etching. J. B. KRAK. *Glass Ind.*, **4**, 10–11(1923).—Description of methods of producing clear and frosted etchings, with recipes for etching solutions. G. S. F.

40. Leers. W. S. MAYERS. *Glass Ind.*, **4**, 21–23(1923).—Discussion of various types, from kilns to continuous fixed pan muffle leers. Most present leers are very wasteful and inefficient but while elec. heating gives better control it is too expensive. G. S. F.

41. From manganese to selenium. I. E. ADAMS. *Glass Industry*, **3**, 219–20 (1922).—Instructions are given for changing a tank of glass from one decolorizer to the other. The following batch is included for narrow neck machine-made bottles: sand 1000, soda 390, burnt lime 110, arsenic 2, borax 2, cullet 700, decolorizer mix as needed. J. B. P.

42. Measurements on the gases evolved from glasses of known chemical composition. J. E. HARRIS AND E. E. SCHUMACHER. *Ind. Eng. Chem.*, **15**, 174–7(1922).—Glasses whose compns. run high in alkali give off more gas during their heat treatment than do those of lower alkali content. A definite relation appears to exist between the amt. of water vapor held by a glass and its alkali content. A relation, although not as pronounced as that mentioned above, appears to exist between the amt. of CO_2 held by a glass and its alkali content. Adsorbed CO_2 seems to be held to a glass primarily by primary valence forces. Adsorbed permanent gases seem to be held to glass primarily by secondary valence forces. Glass relatively free from absorbed gas can be produced by heating the glass during its melting process to a sufficiently high temp. A bibliography of 39 titles follows the article. J. B. P. (*C. A.*)

43. Pyrex glass as a material for chemical plant construction. A. E. MARSHALL. *Ind. Eng. Chem.*, **15**, 141–4(1923).—A description of the development of Pyrex for industrial use particularly in chem. manuf. Tables of properties and sp. applications are included. A. E. M. (*C. A.*)

44. Sir William Crooke's anti-glare glasses. J. H. GARDNER. *Chem. News*, **125**, 375(1922).—Historical. J. B. P. (*C. A.*)

45. A modern annealing cycle. W. O. AMSLER. *Nat. Glass Budget*, **38**, No. 29, 1, 13, 24–5, 27(1922); 3 figs.—The work of the government glass chemists on optical glass during the war is applied to the annealing of commercial bottles in the modern muffle leer. J. B. P. (*C. A.*)

46. The application of calorizing to glass making processes. S. F. COX. *Glass Industry*, **3**, 243–5(1922).—Calorized gas burners, structural shapes and supports of furnaces, recuperator tubes, valves and dampers, bolts and accessories and pyrometer tubes for leers are suggested. J. B. P. (*C. A.*)

47. Conduction process in ordinary soda-lime glass. C. A. KRAUS AND E. H. DARBY. *J. Am. Chem. Soc.*, **44**, 2783–97(1922).—The replacement of Na in glass by other metallic elements has been accomplished by electrolysis. The anode from which the metallic element enters the glass may be either an amalgam or a fused salt. Usually the glass so formed by substitution of the second metal is unstable. Na has been re-

placed by Ag to a depth of about 0.1 mm. The speed of the ions increases greatly with the temp. The cond. of glass is due entirely to the movement of the metallic Na ions. About 75% of the ions are in a condition to conduct. The rest apparently are held rigid.
C. R. P. (*C. A.*)

Heavy Clay Products

48. Tentative specification for clay sewer pipe. ANON. *A. S. T. M. Tent. Stand.*, 232, **1922.**—Cover. I. Materials. II. Size. III. Sampling. IV. Chem. tests. V. Physical tests. VI. Usual inspection. E. N. BUNTING

49. Tentative specifications for required safe crushing strength of sewer pipe to carry loads from ditch filling. ANON. *A. S. T. M. Tent. Stand.*, 237, **1922.**—A table is given covering the crushing strength as a function of the kind of ditch filling material used, breadth of ditch, and height of fill above the top of pipe. E. N. B.

50. Tentative specifications for clay hollow building tile. ANON. *A. S. T. M. Tent. Stand.*, 262, **1922.**—Detailed physical test requirements are given for compression test, freezing, and fire test. Standard sizes, workmanship, marking, and inspection methods are also listed. E. N. B.

51. Tentative definitions of terms relating to hollow tile. ANON. *A. S. T. M. Tent. Stand.*, 318, **1922.**—Definitions are given of the several kinds of tile, the clays used in making tile, and the dimensions and parts. E. N. B.

52. Burning in up-draft furnace kilns. ELIAS PETTS. *Brick and Clay Record*, **62**, 125–6(1923).—P. mentions the usual considerations of all burning problems, namely speed with which fire may be advanced without damage to ware; condition of setting, whether damp or dry; and selection of fuel. A sketch is given of the platting of an up-draft furnace kiln and bricks to be removed before fires are started are marked in diagram. P. further discusses the closing of the platting as the firing increases, also remarks smaller grate surface and air spaces in grate are necessary when burning wood than for coal, and emphasizes keeping of the kiln too tight after it is hot. When using oil as a fuel in this type of a kiln, good results were obtained in an installation having one burner to a furnace and each furnace having two arches. J. W. HEPPLEWHITE

53. Coloration, discoloration and other burning effects. ELLIS LOVEJOY. *The Clayworker*, **79**, 38–9(1923).—A discussion of scumming. Many discolorations are due to S gases and condensation of moisture on the ware in colder parts of the kiln. Improvement and perhaps complete correction can be obtained from slower water smoking, better circulation, more open kiln bottoms and stronger draft. J. W. H.

54. Building drier over kiln. ALEXIS A. ZAKHAROFF. *Brick and Clay Record*, **62**, 415–7(1923).—Description of a drier built over a kiln and sketch of same is given. Cost figures are given, estimating cost of brick at $11.00 to $14.00 per thousand by this method. Z. cites practical hints in the construction of this system gathered from observations of brick plants of this type; such as insulating outside walls, min. number of windows for illumination, side windows create cross drafts, lines for transport care should follow outside walls and should not pass through the center of the installation.
J. W. H.

55. Fire flashing. ANON. *The Clayworker*, **79**, 156(1923).—Discussion not intended as an attempt to explain flashing but to present phenomena in so far as is known. Fire flashing is a color effect produced by reducing kiln atmospheres and faces to be flashed *must be in path of flame.* Best effects are produced at cone 3 to 9; preferably the latter temp. References made to contributions on this subject by H. B. Henderson and J. Parker B. Fiske. Russet color due to amber colored hexagonal plates which owe their development to carbon, likely graphitic carbon. Graphitic carbon present probably from cracked kiln gases especially methane. Graphitic carbon acts as a catalytic agent.

Time is essential for the growth of the hexagonal crystals. Ware which scums presents widest variation in color effects. Olive greens due to limey clays and saffrons attributed to S effects in the water smoking and in incomplete oxidation. J. W. H.

56. Plant design. ANON. *Brick and Clay Record*, **62**, 236(1923).—Description of layout of Cresent China Co. plant at Alliance, Ohio, is given, pointing out labor saving devices and arrangements. J. W. H.

57. A curious defect in salt glazing. ANON. *Brit. Clayworker*, **31**, 319–20(1923).—It was noticed that sewer pipe did not glaze at the sockets. In some cases the sockets were free from the glazes on the outside as well as the inside. Salting as high as seven times did not overcome this defect. This trouble was diminished by vigorous heating prior to salting. It was found that this trouble was really due to the irregular distribution of the draft in the kiln, and by enlarging the flue leading from the kiln to the chimney and building a floor which was uniformly perforated, instead of relying on the solid floor with a complex, yet evidently inefficient arrangement of bricks above it, the pipes were glazed uniformly. The perforated floor was built of fire bricks, arranged so as to leave as many openings, each 4 in. by $2^1/_2$ in., thus passing away at almost uniform rate through every part of the floors. A few of the openings near the center of the kiln were made rather smaller than the remainder so as to counteract the greater "pull" nearer the wall. H. G. SCHURECHT

58. Clay and cement tubing. H. BURCHARTZ. *Mitt. Materialprüfungsamt*, **39**, 15–53(1921).—New data are given for compression strength and resistance to internal pressure. The stability towards acids of clay tubes and the absorption of H_2O and permeability to H_2O of both clay and cement tubing are also given. The results of each individual test are reported in detail because the deviations for tubes of similar shape and material were so large that mean values are considered unreliable. Ruptures were variable, some occurring longitudinally, others both longitudinally and transversely with rough surfaces of varying colors. The tests included tubes of clay and stoneware of circular cross-section, cement of circular cross-section and flat base, cement without base, cement without joints, cement of egg-shaped cross-section and special forms. No law was found giving any relation between size and strength. All results are in kg. per sq. cm. *Clay tubes. External pressure.* The breaking load was 2500–4000 for 80% of the tubes, with 6% below this range. The mean values of all tubes (20 to 100 cm. inside diam.) lay between 3160 and 4090. The mean of all the av. values was 3580. *Internal pressure.* The mean value (tangential stress) of all tubes varied from 34.3 to 77.7. The mean of all av. values was 59.7. *Cement tubes. Circular tubes.* The breaking load was essentially 2500–5500, with only 8% below this range and 16% above. The highest breaking loads were 7600 and 7620 for 2 tubes of 40 cm. diam. The mean values for the various sizes varied from 2630 to 5280 and the mean of all averages was 4150. *Egg-shaped tubes.* The breaking load was for the majority 4000–7000 with 17% under and 21% over this range. A tube of 70/105 cm. inside-outside diam. gave 11,010. The mean values of all sizes were 4260–8200, and the mean of all averages was 5270. By the standard test, the soly. of most of the clay tubes in H_2SO_4 was 0.04–.08%, with 1 case of 0.23%. Cement tubes immersed in 0.5% HOAc, HCl, H_2SO_4 and HNO_3 showed surface attack, due to the Ca compds. present. H_2O absorption was 2.1–5.3% for clay tubes and 7.1–7.7% for cement tubes. Cement tubes were found both porous to H_2O and waterproof. Clay tubes were those with porous surface and a H_2O absorption up to 10% and stoneware tubes as those with a vitrified surface and H_2O absorption not over 5%. C. C. D. (*C. A.*)

Refractories

59. Tentative method of test for resistance of fire clay brick to spalling action. ANON. *A. S. T. M. Tent. Stand.*, 297, **1922.**—Bricks are given a preliminary heating

for five hrs. at 1400°C. One end is exposed in door of furnace to 1350°C for one hr., then removed and put in cold running water for 3 min. Alternate heatings and coolings are made until the end of brick spalls off. E. N. B.

60. Tentative method of test for slagging action of refractory materials. ANON. *A. S. T. M. Tent. Stand.*, 293, **1922.**—A fire clay ring is cemented with refractory cement on the brick tested, and a synthetic slag placed within the ring. The prepared brick is fired to 1350°C for 2 hrs. When cold the brick is broken through the center of the ring and the penetration and attack by the slag noted and measured with a planimeter. E. N. B.

61. Dry pressing refractory shapes. L. W. FLOOD. *Brick and Clay Record*, **61,** 865–6(1922).—Stiff mud process requires a large percentage of plastic material, the same holds true of the soft mud process except in the case of silica, magnesite and chrome, also soft mud process cannot be used for manuf. of large shapes unless some supports are placed around sides of shapes when taken from mold. A high percentage of plasticity is not essential for dry press ware since pressure at times is about 5000 to 6000 lbs. per square in. Plasticity, however, should be developed to the best practical degree in order to produce the best brick possible with least expense, trouble and loss. In some cases high plasticity may cause ware to split. The addition of grog, sand or calcined material assists in overcoming this trouble. Moisture content in dry press ware usually runs about 7%. Too dry a mixture causes difficulty in handling. Homogeneity of material is important. The clay should be fed to some type of screen before going through the pan, as too large a propn. of coarse sizes reduces the plasticity of the mass, even though the clay when properly ground may be classed as plastic. It also renders the propn. of good brick more difficult and expensive. A mech. mixer is necessary and should be placed just above the press to keep the fine and coarse particles properly mixed. The clay from the mixer should have a perpendicular chute into the press. It is advisable to use as high a pressure as is possible without producing pressure checks, as high pressure makes stronger brick. F. summarizes the advantages gained by making large shapes by dry press process as follows: 1. Cost of manuf. reduced. 2. Cost of installing expensive dryers or dry floors will be lessened. 3. Resultant ware will be more uniform and exact in size. 4. Refractoriness of some clays will be increased. 5. Uniform size of ware will reduce the fire clay used in the joints. 6. Large refractory shapes made by dry press process are able to withstand thermal shock much better than the same shapes made by another process. 7. Dry press ware is a poorer conductor of heat. A diagram of a section through model dry press plant showing most important features is given. J. W. HEPPLEWHITE

62. Improvement of refractories. ANON. *Brick and Clay Record*, **61,** 867(1922).—A survey is to be conducted by the Refractories Manufacturers' Association in coöperation with various committees. Survey will consume the better part of two years and will employ the use of an elaborate questionnaire distributed among consumers of refractory brick which will include blast furnaces, stoves and connections; open hearth furnaces and metal mixers; heating, puddling and forge furnaces, cupolas; malleable furnaces, oil refineries; gas plants; glass houses; by-product coke ovens; zinc, copper and lead refineries; boilers; cement, lime and plaster kilns and kilns for burning ceramic products. J. W. H.

63. The nature of graphite and amorphous carbon. GENSHICHI ASAHARA. *Sci. Papers Inst. Phys. Chem. Research*, **1,** 23–9(1922); *Japan. J. Chem.*, **1,** 35–41(1922); cf. Debye and Scherrer, *C. A.* **12,** 786.—The essential identity of graphite and amorphous C has been established by the *X-ray analysis of 34 different forms of C* from different sources. They were ground into fine powder and pressed to layers of about 1 mm. thickness. These were fixed in front of a small window of a wooden box contg.

a photographic plate and placed in a lead camera. The interference figure of the material was recorded on the plate as concentric rings, the plate cutting the mantles of cones of the diffracted rays. Six of these cameras were arranged conically, with the vertex in the source of X-rays facing the X-ray bulb in a shielded box. The interference figures thus obtained constitute an unbroken series, gradually altering from those with 6 comparatively sharp concentric rings of intensity maxima (Type I) to those with an indistinct halo of distributed intensity (Type III). Those whose intensity maxima are not sharply defined but broadened ill-defined bands (Type II) lie between the two extremes. Certain forms of graphite, such as Ceylon and Korean graphites, etc., gave figures with radiant streaks (Type IV), the intensity maxima being common to graphites appearing intact. The streaks may be attributed to the fact that these graphites are only ground along their flat cleavage faces and the incident rays fall chiefly and almost perpendicularly on their cleavage faces. The angles corresponding to the six concentric rings, which the diffracted rays make with the incident rays, are approx. 14°, 18° 50′, 22° 20′, 25° 40′, 31°, and 36° 30′, resp. The natural and artificial graphites, however finely they may be powd., possess a cryst. structure, as they plainly show sharply defined interference rings. Amorphous C also gives interference figures, but no distinct maxima are observed owing to the distributed intensity. Their estimated maxima are however invariably at about 14° and 23°. Carbons produced by the decompn. of certain gases or vapors, such as CO, C_2H_2, or CS_2, or Fe_3C and coal, gave no sign of definite crystalline form, but they gave definite interference figures which establish their cryst. nature. The word "amorphous" must, therefore, be replaced by "extremely minutely cryst."

K. K. (*C. A.*)

64. High-temperature melting. ANON. *Iron Age*, **110**, 1507(1922).—A description of the elec. furnace equipment of the rare metal alloy refining and melting plant of the Bario Metals Corp. The equipment includes 3 graphite resistance furnaces and 1 high-frequency induction furnace. L. J. (*C. A.*)

65. Ajax-Wyatt furnace in the brass-mill casting shop. R. P. HEUER. *J. Ind. Eng. Chem.*, **14**, 1021–4(1922).—A method is developed for calcg. the proportions of a vertical ring induction furnace which will result in a well-balanced mechanism. Operating procedure and furnace schedules are discussed and a comparison is made between induction furnace and crucible melting of brass in rolling mills. L. J. (*C. A.*)

66. A new induction furnace. J. M. WEED. *Trans. Am. Electrochem. Soc.*, **42** (preprint); *Chem. Met. Eng.*, **27**, 977–9(1922).—A description of a new type of induction furnace for melting non-ferrous metals (see *C. A.*, **16**, 3814). An explanation is given of the manner in which the magnetic forces establish max. and min. fluid pressures at opposite ends of the secondary cylinder and maintain a unidirectional circulation of metal.

L. J. (*C. A.*)

67. A new cupola lining. KARK GROCHOLL. *Die Giesserei; Iron Age*, **110**, 1279 (1922).—In Germany a loose refractory mixt. is being used for ramming up the cupola lining, instead of fire brick and blocks. The cost is only $^1/_{30}$ that of fire brick. Patching is done after every heat, with unskilled labor, and a new lining is not required within 2 yrs. A. B. (*C. A.*)

68. Bavarian graphite. EUGEN RISHKEVICH. *Chem.-Ztg.*, **46**, 1013–6, 1035–6 (1922).—The graphite occurs in gneiss, replacing mica and associated with pyrite. It varies from 12 to 40%, usually 20 to 25%, C content, that under 12% not being worth mining. The ore comes in lenses, and mining is expensive. Crushing, sizing and wet concn., followed by fine grinding and concn., give a concentrate of 65% C, which can be raised to 80–90% by dewatering. Tests are described indicating the superiority of Bavarian graphite in elec. cond., heat cond., resistance to combustion, etc., when compared with other kinds. W. C. E. (*C. A.*)

69. Cement kiln insulation. P. C. DURBIN. *Concrete* (Mill Section), **22,** 2–4 (1923).—The advantages of an efficient insulating material in a cement kiln are: (1) a marked saving of fuel, (2) better working conditions, (3) longer life of shell and auxiliary equipment, (4) longer life of refractories, (5) more uniform distribution of heat, (6) ease of temp. control and (7) conservation of unused heat for power production.

J. C. W. (*C. A.*)

70. A new refractory material. W. SMITH. *J. West Scotland Iron and Steel Inst.*, **30,** 8–13(1922).—The new refractory is *carbonized clay*. Mixts. of C and clay are old but carbonizing by C-charged gases has never been well developed. Charging is done when the clay is in the biscuit state and at max. porosity. Shrinkage, with higher burning, then compresses the C to a d. comparable to that of steel. So long as carbonized clay remains in a reducing atm. it will withstand the highest com. temps. and is unaffected by acids. Much skill is required in the carbonizing process. Ground raw clay and coal are heated together in a muffle kiln. The evolved gases may be used for fuel and coke is obtained. Pitch may be used as a binder in forming shapes of carbonized clay. There is no after-contraction. White carbonized clay is made by burning out the C in carbonized clay. The black is suitable for heat resistance in a reducing atm., for acid-resisting ware and for abrasives. The white is suitable for heat resistance in an oxidizing atm. Carbonization may be a means of extracting Fe and alkalies from clays. The reports are based upon lab. tests. Com. tests will be made. C. H. K. (*C. A.*)

BOOK

71. A comparison of British and American Foundry Practice. P. G. H. BOSWELL. Liverpool, England: University Press of Liverpool, Ltd. Cleveland: The Foundry. 106 pp. $1. Reviewed in *Foundry*, **51,** 11(1923). (*C. A.*)

Whitewares

72. American and English Ball Clays. H. H. SORTWELL. Bureau of Standards, *Tech. Papers* **227.**—The 21 ball clays being used in the largest quantities in the manufacture of china, semiporcelain, elec. porcelain, sanitary ware, and floor and wall tile were studied at the Bureau of Standards. Detns. were made of the water of plasticity and shrinkage relations upon drying, amount of arenaceous material retained by 120-mesh sieves, rate of flow of slips, cohesion of the plastic clay, dry transverse strength when mixed with an equal part of flint, time required for oxidation of carbonaceous material at 75°C, porosity and vol. changes from Orton Seger cone 01 to cone 12, and coloring effect in a standard body. No great differences were noted in water of plasticity, all of the clays falling within a range of a few per cent. The Dorset clays showed a slightly higher drying shrinkage than the other clays studied. All of the clays showed a tendency to warp in drying but none developed cracks. The Amer. clays were much cleaner than the English and contained less coarse mineral matter and dirt which would be removed in lawning the body after blunging. The Ky. clays were almost free from such material, and the Tenn. clays contained only a small amount, while the English clays were less desirable in this respect. The transverse strength of equal mixts. of the clays with commercial potters flint was detd. to give a better indication of the comparative bonding power of the clays in a body than would be indicated by the modulus of rupture of the clay alone. The average modulus of rupture of the Tenn. clays tested was 366 lbs. per square inch, the Ky. clays averaged 282 lbs. per sq. in., the clays from Dorset, Eng., 405 lbs. per sq. in., the Devonshire clays 443 lbs. per sq. in., and English clays, whose exact source was not known, 419 pounds per square inch. In general the English clays were stronger than the domestic, but two of the Amer. clays compared favorably with the average English clay. From the results obtained the rate of flow of slips from the

efflux viscosimeter did not appear to be a valuable criterion of the inherent plastic qualities for use in comparing ball clays. Sol. salts in the clays probably affect the results. The cohesive strengths of the plastic clays were determined at different water contents and are shown graphically. These results showed no distinctions which compared with the value of the clays for jiggering as judged by practical potters. Some of the English clays are very high in carbonaceous matter, 11 hrs. being required in two cases to completely remove the black core from specimens $1^1/_4$ by $1^1/_4$ by 2 in. The clays from Devonshire as a class required the longest time for oxidation. The Dorset clays and those from Tenn. contained a moderate amount of carbonaceous matter while the Ky. clays contained but little. It was noticed that there was a relationship between the amount of carbonaceous matter and the strength when dry, the more carbonaceous clays usually being stronger. The burning behavior of the American and English clays was radically different. The English clays vitrified at a low temperature and remained almost constant in porosity and volume up to cone 12. No evidence of overburning was noticed at that temperature. There was some variation in the burning behavior of the clays from Devonshire, but the Dorset clays underwent practically the same changes in firing. The American clays showed a gradual reduction in porosity from cone 01 to cone 12. Tenn. ball clay No. 5 was the only domestic clay which vitrified at cone 8. Tenn. No. 3 matured at cone 10, and Tennessee No. 11 and Kentucky No. 4 at cone 12. The other two Kentucky clays studied were not vitrified at cone 12. Throughout the firing range studied the American clays were constantly changing in volume. In the standard body the Tennessee clays as a class showed the best color. The Ky. and Devon clays were fair in this regard while the Dorset clays were comparatively poor in coloring effect. Although the English clays have a more desirable firing behavior and greater strength when dry, the American clays contain less material to be removed in body prepn., contain less carbonaceous matter which may lead to trouble in firing, and burn to a better color in the body. Because of their better color they may be used in larger quantities, thereby overcoming in a measure their lower strength. With a slight adjustment in flux content of the body they may be successfully used to replace the English clays. A classification of ball clays based on their properties has been drawn from the results of the work. The complete paper may be purchased from the Supt. of Documents, Government Printing Office, Washington, D. C. H. F. S.

73. Studies of changes in the physical properties of a hard porcelain caused by varying the feldspar from Na to K feldspar and by varying the burning treatment. E. Roth. *Sprech.*, **55**, 533–4(1923).—Porcelains of the following general compns. were studied: clay 50, quartz 25 and feldspar 25. R and Na feldspars of the following compns. were used.

Six	K feldspar	Na feldspar
SiO_2	64.3%	67.1%
Al_2O_3	19.4%	20.3%
Fe_2O_3	0.1%	0.3%
CaO	tr.	0.8%
MgO	0.4%	tr.
K_2O	12.9%	tr.
Na_2O	2.1%	11.8%
Ignit. loss	0.6%	0.1%

Various mixts. of Na and K feldspars were studied varying from pure Na feldspar on one extreme to pure K feldspar on the other. Porcelains prepd. with these feldspars were fired to cones 9, 11–12, 13, 14, 15, 15–16. A study of the thin sections showed that at 1120°C the feldspar melted. Upon increasing the temp. a portion of the clay substance goes into solution and the sillimanite crystallizes out. The coarse grains of crystalline

quartz do not go into solution until a temp. of 1480–1500°C are reached. Upon further heating the sillimanite crystals are taken into soln. until at 1600°C a homogeneous body is obtained. The following conclusions were drawn: (1) The K rich porcelains produce bodies having a higher viscosity than the Na rich porcelains. (2) The saturation of Na and K feldspar with clay substance was determined by means of the indices of refraction of the glass. It was found that the K feldspars dissolved 20% clay and the Na feldspar dissolved 15% clay. (3) The solubility of silica in the glass depends upon the size of grain, cryst. modification of Si and the firing temp. (4) Na feldspar exerts a stronger soln. action upon silica than K feldspar. (5) Maximum shrinkage occurred at cone 9 and above this temp. the mass commenced to swell. (6) The sp. grs. of both the Na and K bodies decreased with an increase in firing temp. (7) The linear coeff. of expans. decreased up to cones 11–14. Since the thin sections showed that at this temp. the K body had not and the Na body had only slightly dissolved the coarse quartz grains, it seems that the finely dispersed Si resulting from the dissociation of the clay is dissolved by the glass. With the Na body the decrease in expans. is very marked at this temp. (8) The translucency increased up to cones 12–14. The translucency remains about the same between cones 12–14 but when fired about cone 14 the coarse quartz grains are dissolved and the translucency increases. The Na bodies are slightly more translucent than the K bodies. (9) The impact cross-breaking test and the ball compression test gave a max. at the temp. where max. shrinkage and density is developed. Between cones 12 to 14 a small decrease in strength is obtained and above cone 14 an increase was again developed. (10) Both the K feldspar and the Na feldspar bodies gave a dielectric constant of 5.8. The elec. penetration depends largely upon the porosity of the body. H. G. SCHURECHT

74. Antimony yellow glazes. W. ROHN. *Keram. Runds.*, **31,** 31(1923).—A study was made of cone 3*a* Sb yellow Pb glazes. The success of this type of glaze depends upon (1) the constituents in the glaze, (2) an oxidizing kiln atmos., and (3) a cer-

ANTIMONY YELLOW LEAD GLAZES

1.	0.80 PbO 0.20 K_2O	0.15 Al_2O_3 2 SiO_2 + 3% HSb_2O_3, nice yellow, 6% HSb_2O_3, dirty (ocher yellow)
1*a*.	0.80 PbO 0.20 K_2O	0.15 Al_2O_3 { 2 SiO_2 / 0.4 B_2O_3 } + 3% HSb_2O_3, nice yellow
2.	0.80 PbO 0.20 Na_2O	0.15 Al_2O_3 2 SiO_2 + 3% HSb_2O_3, very nice yellow, 6% HSb_2O_3 or SnO_2, dirty color
2*a*.	0.80 PbO 0.20 Na_2O	0.15 Al_2O_3 { 2 SiO_2 / 0.4 B_2O_3 } + 3% HSb_2O_3, beautiful yellow, 6% HSb_2O_3, dirty color
3.	0.80 PbO 0.20 MgO	0.15 Al_2O_3 2 SiO_2 + 2% HSb_2O_3, yellow, 4% HSb_2O_3, dirty, 8% pale yellow
4.	0.80 PbO 0.20 BaO	0.15 Al_2O_3 2 SiO_2 + 3% HSb_2O_3, pale yellow
5.	0.80 PbO 0.20 CaO	0.15 Al_2O_3 2 SiO_2 + 3% HSb_2O_3, pale yellow
6.	0.80 PbO 0.20 SrO	0.15 Al_2O_3 2 SiO_2 + 3% HSb_2O_3 almost white, 5% HSb_2O_3, same as with 3%
7.	0.80 PbO 0.20 ZnO	0.15 Al_2O_3 2 SiO_2 + 3% HSb_2O_3, yellow, with 5% HSb_2O_3, dirty

tain transparency of the glaze. Excellent results were obtained with glazes having an RO composed of 0.8 to 0.9 PbO and 0.1 to 0.2 KNaO. Good colors were also obtained with glazes having an RO composed entirely of PbO. Extra good colors were obtained

with glazes having 0.1 to 0.2 Na_2O and 0.8 to 0.9 PbO. This compn. produced Neapolitan yellow shades. The alkali earths on the other hand destroy the yellow color with the exception of MgO. Although MgO prevents to a certain extent the formation of the desirable Neapolitan yellow shades it does not destroy the yellow color as CaO does. BaO acts very similar to CaO while a glaze containing 0.8 PbO and 0.2 SrO_2 produces a white glaze entirely destroying the yellow color. ZnO, Al_2O_3 and SiO_2 do not have much influence on the yellow color. B_2O_3 does not affect the color but gives the glaze a high gloss. Glaze 2*a* shown in the table produces a bright egg-yellow color which is not possible to obtain with a glaze free from B_2O_3. The addition of a small percentage of Fe_2O_3 to a yellow glaze produces an orange-yellow. Opalescent-yellow glazes have a dirty color being similar to China-reds in this respect. 1 to 3% HSb_2O_3 gives best colors. The addn. of 6% SnO_2 to a yellow glaze changes its color to ocher. With alkali earth free glazes yellows are obtained above 0.35 PbO. By changing the Al_2O_3 and SiO_2 contents glazes suitable for stoneware may be prepd. These glazes may also be used for china painting. By varying the PbO and Sb_2O_3 contents a series of colors varying from sulphur-yellows to orange-yellows may be prepd.

H. G. SCHURECHT

75. Sagger investigation. ANON. *Brick and Clay Record*, **61**, 960(1922).—Bureau of Standards are testing 52 different sagger clays sent by the consumers in order to locate the causes of sagger losses. Clays for classification purposes will be tested for water of plasticity, shrinkage, porosity, transverse strength and burning behavior at 5 different cones. J. W. H.

76. Report of committee D-9 on electric insulating materials. F. M. FARMER, *et al. Proc. Am. Soc. Testing Materials*, **22**, I, 472–8(1922).—Recommendations for slight changes in present tentative methods and an outline of work during the yr.

C. C. D. (*C. A.*).

Equipment and Apparatus

77. Heat insulating materials for electrically heated apparatus. J. C. WOODSON. *Trans. Am. Electrochem. Soc.*, **43**, preprint(1923).—While there are numerous grades of heat insulators, none can compare with elec. insulators. Of all the various grades there are only a few basic materials used. True insulation value lies almost entirely in the entrapped dead air spaces of the structure, and this goes back to the phys. structure of the cell or crystal. Working temp. ranges may be grouped under 5 divisions below 93°, 93–177°, 177–315°, 315–538°, 538–1093°. To cover these temp. ranges, practically all com. grades of insulators can be grouped into 3 classes as follows:—Class *A*, —18° to 93°, hair, wool, felt, wood pulp, animal and vegetable fiber, asbestos paper and cork; Class *B* (most important), 93–538°, magnesia, sponge, earths, mineral wool and asbestos; Class *C*, 315–1093°, diatomaceous earth, mineral wool, earths and silicates. Since the law of heat flow is analogous to Ohm's law 2 formulas are given. For flat surfaces with the customary units the formula is: $Q = KAt\,[(T_1 - T_2)/d]$, where Q = B. t. u. transmitted, A = sq. ft., t = time in hrs., d = thickness in inches, $T_1 - T_2$ = °F, and K = coeff. of thermal cond. = B. t. u. per sq. ft., per inch of thickness, per hr., per Fahrenheit degree. For cylindrical surfaces $Q = \frac{K(T_1 - T_2)}{R \log_e (R_2/R_1)}$, where R_1 = inside radius of covering in inches and R_2 = outside radius. The numerous attributes desired in insulators are outlined. Complete tables are given showing attributes of many com. grades. Curves are given which show that the const. K does not increase directly with thickness, and that its value is not const. for all temp. differences.

C. H. E. (*C. A.*)

78. Colloid mill and the ultra-filter press. A. W. KENNEY. *Chem. Met. Eng.*, **27,** 1080–5(1922).—Two types of colloid mill are described: (1) an impact mill in which the charge of liquid and ground solid is "beaten" by a toothed wheel revolving at very high velocities (up to 12,000 r. p. m.), and (2) a friction mill in which the charge is forced axially under pressure between 2 disks rotating rapidly in opposite directions. By the use of these mills it is possible to form colloidal solns. of diverse types of solids (wood, oil shale, phosphate rock, etc.), and various tech. applications are suggested. The use of the mill also has a tendency to improve reaction conditions between 2 liquids or a liquid and a solid. In the ultra-filter press the excess of dispersion medium may be removed from the colloidal soln., forming a paste of the colloid, and yielding a clear filtrate; the operation is continuous. A bibliography is given. D. W. M. (*C. A.*)

79. Suggested methods for verification of testing machines. J. A. CAPP, *et al. Proc. Am. Soc. Testing Materials*, **22,** [1], 521–33(1922).—Definitions, methods for verifying the accuracy of machines and tolerances are given. C. C. D. (*C. A.*)

80. The "Davon" micro-telescope and supermicroscope. F. DAVIDSON. *Chem. News*, **125,** 353–5(1922).—This instrument can be utilized as a telescope or microscope. When used as the latter its working distance is greater than that with an ordinary microscope. D. E. S. (*C. A.*)

BOOKS

81. Standard Specifications for Laboratory Apparatus Adopted by the Manufacturing Chemists' Association of the United States. Part I. Graduates and Thermometers. Washington, D. C.: Mfg. Chemists' Assoc. of the U. S. 49 pp. $1.50. Reviewed in *Ind. Eng. Chem.*, **15,** 214(1923). (*C. A.*)

82. Measurement of Gas and Liquids by Orifice Meter. HENRY P. WESTCOTT AND JOHN C. DIEHL. 2nd Ed. Erie, Pa.: Metric Metal Works. 434 pp. $4.50. Reviewed in *Mech. Eng.*, **45,** 148(1923). (*C. A.*)

Kilns, Furnaces, Fuels and Combustion

83. Burning brick with electricity. ANON. *The Clayworker*, **78,** 545(1922).—Expts. have been made in western Norway near Sandnes in operating brick ovens of American manuf. by electricity. Favorable results were obtained. It is calcd. with manuf. of bricks on a large scale av. consumption of electrical power would be 1 kw. per brick which necessitates cheap power rates. J. W. HEPPLEWHITE

84. Ceramic firing in electric furnaces. E. L. SMALLEY. *Trans. Am. Electrochem. Soc.*, **42** (preprint).—Properly designed elec. furnaces are entirely dependable for ceramic firing at any temp. up to 1100°. Elec. furnace firing has been used to advantage in the manuf. of grinding wheels, china, glassware, and bifocal lenses. L. J. (*C. A.*)

Geology

85. Barytes and witherite. G. V. WILSON AND OTHERS. *Memoirs Geol. Surv.* (London), **1922.** 3rd ed.—This rept. on barytes and witherite gives characters of the barium minerals; sources of supply; commercial uses of barytes and witherites; industrial notes; detailed account of the mines and present-day mining; with descriptions of methods of treatment of the ore at various places, and means of transport. The report has graphic tables showing the total output of barium minerals in the United Kingdom since 1890; also maps of barytes and witherite areas. O. P. R. O.

86. Lac, turpentine, and rosin. (India.) ANON. *Imperial Inst. Repts.* (London), **1922.**—Shellac is a characteristic Indian product, 94 per cent of the world's supply comes from India and Burma. It is a resinous exudation produced by the lac insect, *cocus lacca*,

on various trees. The lac industry in India is unsatisfactory, and recommendations for improvements are given in this report. Turpentine and rosin have been produced in India for some time, on a small scale, only one species of pine being tapped commercially, and the turpentine from this tree is inferior to that produced in the American and French forests. It appears that better turpentine could be obtained from two other trees, *pinus excelsa* and *pinus khasya*. The industry is still in the experimental stage, but might be increased in ten years to 120,000 cwts. of turpentine, and 430,000 cwts. of rosin. O. P. R. O.

87. Strontium minerals. 1913–1919. ANON. *Imperial Mineral Resources Bur.*, **1923.**—Of the strontium minerals, celestite ($SrSO_4$), the sulphate, is the most important. It is found at some localities in sufficient quantities to be quarried as a source of strontium salts. Strontianite ($SrCO_3O$), the carbonate, also occurs abundantly in some localities, it has been worked commercially, but to a less extent than celestite. Strontium compounds are used chiefly in sugar refining and pyrotechny, sometimes as a substitute for barytes in fillers, in the manuf. of chem. reagents, medicines and glass. This report gives the world's production of strontium minerals from 1913 to 1921; with brief reviews of occurrences in the United Kingdom, Canada, India, France, Germany, Sicily and the U. S., and concludes with a bibliography on strontium minerals. O. P. R. O.

88. British Columbia clay. ANON. *Brit. Clayworker*, **31,** 360.—Samples of pottery clay taken from Lilloet, Central B. C., have been declared of the very finest quality by an expert at Portland, Oregon. He declared that samples sent to him were better than any he had seen in W. Australia. O. P. R. O.

89. Bituminous sands. (Alberta.) S. C. ELLS. *Bulletin*, Lower Athabaska and Slave River District (**1922**).—In this bulletin issued by the Natural Resources and Intelligence Branch, Canada, Mr. Ells summarizes: An extensive deposit of bituminous sand outcrops through an aggregate distance of 200 mi., centering about McMurray. 250 exposures, all of which represent portions of one continuous deposit, have been examined and measured. The outstanding features: 1. That the deposit represents the largest known occurrence of solid asphaltic material. 2. That the deposit is, as yet, totally undeveloped. 3. That at the present time practically all asphaltic materials used in Canada are imported from foreign countries. O. P. R. O.

90. A fossil resin from British Columbia. R. T. ELWORTHY. *Can. Inst. Min. and Metallurgy Bulletin*, **130,** 29(1923).—Fossil resin in coal from Coalmont, British Columbia is reported to be amber. E. gives a brief summary of the work that has been carried out on this fossil resin in the laboratories of the Mines Branch, Department of Mines, Canada; giving chem. and phys. properties of the resin, and particularly stressing its comparison with amber; and its industrial uses. O. P. R. O.

91. Canadian kaolin. ANON. *Raw Mat. Rev.*, **2,** 97(1923).—A syndicate of Vancouver business men is now planning the exploitation of large deposits of kaolin in the Cariboo district of B. C., and proposes the establishment of a fine pottery and tile industry. The clay is pure white and Govt. analyses show it to be of excellent quality. A test made at the Govt. Laboratory, Ottawa, produced a hard, white, non-absorbent tile which takes good glaze, and is pronounced equal to any imported from England. With the addition of feldspar and ball clay, which are also found in B. C., a first class china can be manufactured from Cariboo kaolin. O. P. R. O.

92. New diatomaceous earth deposit. ANON. *The Clayworker*, **79,** 155(1923).—A new deposit of diatomaceous (infusorial) earth has been opened in Maryland on the Patuxent River east of Washington. Claimed to be the best deposit in Eastern United States. J. W. H.

93. Manufacture and uses of diatomaceous earth. ANON. *Brick and Clay Record*, **62,** 414(1923).—Methods of handling deposit of diatomaceous earth at Lompoc,

Cal. is given. Area of deposit is several square miles and ranges up to 700 feet in thickness. Principal uses of diatomaceous earth are listed as compressed brick; compressed brick midway in quality of sawed brick and ordinary fire brick; ground product used as filtering material in sugar mills; light weight filler in concrete instead of rock aggregate; insulation purposes; automobile polish, etc.; nitroglycerine absorbent in some grades of dynamite. J. W. H.

94. The physical chemistry of the crystallization and magmatic differentiation of igneous rocks. V. J. H. L. Vogt. *J. Geol.*, **30,** 611–630(1922).—The influence of pressure is discussed. In deep-seated rocks the rise of the melting point of rock-forming minerals is inconsiderable. Many minerals such as olivine, monoclinic pyroxene, feldspars, spinel, magnetite, etc., can form under either low or high pressures. Melilite is found only in extrusive types (low pressure) the corresponding intrusives containing instead olivine and anorthite-bytownite. Likewise the leucite in low-pressure rocks is replaced by microcline and biotite. The formation of garnet is favored by high pressure. **VI.** *Ibid.*, 659–72.—The influence of the light volatile compds. as H_2O, CO_2, etc., is discussed. During crystn. the vol. material will be disposed of as follows: Some will escape if the pressure is high, some will be included in the minerals as inclusions, some may enter in solid soln., some may enter the crystg. minerals as H_2O in micas, the rest will remain in the magma and be concd. in the mother liquid. It is estd. that 4% indicates the max. original content of H_2O in the parent magmas. W. F. H. (*C. A.*)

95. Graphic study of igneous rock series. F. F. Grout. *Bull. Geol. Soc. Am.*, **33,** 617–38(1922).—The nature of differentiation in 40 rock masses is shown by diagrams based on alkalies and SiO_2. Some of the conclusions are: (*a*) magmas need not be of any particular compn. in order to develop into a differential series, (*b*) the trend of differentiation is in different directions in different localities even when the magmas are similar, (*c*) nearly all alkaline rock masses have some phase near the av. nephelite syenite, (*d*) the primary magma approaches av. basalt but varies considerably. W. F. H. (*C. A.*)

96. The chemistry of the earth's crust. H. S. Washington. *Smithsonian Rept.*, **1920,** 269–319(1922).—The conditions prevailing in the earth's interior are briefly discussed, followed by a description of the general character of igneous rocks. The number of essential rock-forming minerals is small; they are silicates of Al, Fe, Mg, Ca, Na and K. The maxima and the usual range of the principal rock constituents are as follows: SiO_2, max. 99%, usual range, 75–34; Al_2O_3, 60, 20–10; Fe_2O_3, 88, 15–0.5; FeO 35, 15–0.5; MgO, 49, 25–1; CaO, 23, 15–0; Na_2O, 19, 15–0; K_2O, 18, 10–0; H_2O, 10, 2–0; TiO_2, 70, 2–0; P_2O_5, 16, 1–0; MnO, 2, 0.3–0. An estimate of the av. compn. of igneous rocks, based upon 5159 "superior" analyses is given: SiO_2 59.09, Al_2O_3 15.35, Fe_2O_3 3.08, FeO 3.80, MgO 3.49, CaO 5.08, Na_2O 3.84, K_2O 3.13, H_2O 1.14, TiO_2 1.05, P_2O_5 0.30, MnO 0.125, CO_2 0.102, ZrC_2 0.039, S 0.053, Cl 0.056, F 0.078, Cr_2O_3 0.056, V_2O_3 0.032, NiO 0.025, BaO 0.055, SrO 0.022, Li_2O 0.007%. This approximates to a granodiorite. The av. compn. of the earth's crust by elements is estd. as: O 46.43, Si 27.77, Al 8.14, Fe 5.12, Ca 3.63, Na 2.85, K 2.60, Mg 2.09, Ti 0.629, P 0.130, H 0.127, Mn 0.096, F 0.077, Cl 0.055, S 0.052, Ba 0.048, Cr 0.037, Zr 0.028, C 0.027, V 0.021, Ni 0.019, Sr 0.018, Li 0.003, Cu 0.002, Ce, etc. 0.001, Be 0.00xx, Co 0.00xx B 0.000x, Zn 0.000x, Pb 0.000xx, As 0.000xx, Cd 0.0000xx, Sn 0.0000xx, Hg 0.0000xx, Sb 0.0000xx, Mo 0.00000xx, W 0.00000xx, Bi 0.00000xx, Se 0.000000xx, Au 0.000000xx, Br 0.000000xx, Te 0.0000000xx, Pt 0.0000000xx, sum 100%. The elements are referred to two main groups in the periodic table; the petrogenic elements, abundant in igneous rocks, of low at. wt., normally occurring as chlorides, fluorides, oxides or silicates; and the metallogenic elements, rare in igneous rocks, occurring as ores of high at. wt. and forming in nature "native" metals, sulfides, arsenides, bromides, etc. The suggestion

is made that beneath a silicate crust of petrogenic elements is a zone essentially of Ni-Fe and beneath this a core of metallogenic elements. In igneous rocks and minerals the elements show a correlation of occurrence, oxides of Si, Al, K, Na tend to go together; Mg, Fe; K, Mg; Na, Fe; Na and Li, Zr, Ce, Cl, F; Mg and Pt, Cr. The idea of comagmatic regions is discussed and some are briefly described. The calcn. of rock ds. from their compn. is discussed, and the av. ds. of the continental masses and ocean floors are calcd. and shown to stand in inverse relation to their elevations. This is confirmative of the theory of isostasy. E. F. H. (*C. A.*)

BOOKS

97. High-grade clays of the eastern United States with notes on some western clays. H. RIES, W. S. BAYLEY, *et al.* U. S. Geol. Survey, *Bull.* **708,** 305 pp.(1922).—Statistics of production, imports and exports are given. Over 80 chem. analyses of the various clays are recorded, principally those from deposits in Pa., Va., Fla., Ala., Miss., Tenn., Ky., Ill., and Ark. Mineralogical compns., phys. tests and fire tests are tabulated in large numbers. The requisite qualities of high-grade clays for different purposes are specified. The deposits of kaolins or white residual clays are discussed in 114 pages, residual clays of undetd. derivation in 32, Indianaite in 15, sedimentary clays of the Coastal Plain and the Embayment area in 129, and the microscopic study of clays in 13. L. W. R. (*C. A.*)

98. Essentials for the Microscopical Determination of Rock-forming Minerals and Rocks. ALBERT JOHANNSEN. Chicago: The Univ. of Chicago Press. $2.10. Reviewed in *Eng. Mining J.-Press,* **114,** 775(1922). (*C. A.*)

99. Elements of Optical Mineralogy. An Introduction to Microscopic Petrography. N. H. WINCHELL AND A. N. WINCHELL. 2nd Ed. Revised and enlarged. Part I. Principles and Methods. New York: John Wiley & Sons, Inc. $3.50. Reviewed in *Eng. Mining J.-Press,* **114,** 1082(1922). (*C. A.*)

100. Rocks and Their Origins. GRENVILLE A. J. COLE. 2nd Ed. Cambridge: The University Press. 175 pp. 4s. Reviewed in *Nature,* **110,** 768(1922). (*C. A.*)

101. Dana's Text Book of Mineralogy. W. E. FORD. 3rd Ed. Enlarged. New York: John Wiley and Sons, Inc. 720 pp. 31s. 6d. in Australia. Reviewed in *Chem. Eng. Mining Rev.,* **15,** 137(1922). (*C. A.*)

102. Smithsonian Institution's Study of Natural Resources Applied to Pennsylvania's Resources. SAMUEL S. WYER. Washington: Smithsonian Inst. 150 pp. Reviewed in *Chem. Met. Eng.,* **28,** 130(1923). (*C. A.*)

Chemistry and Physics

103. Electrolytes' effect on plastic clay. J. D. BRUMBAUGH. *Brick and Clay Record,* **62,** 221–9(1923).—Purpose of investigation was to det. the effect, if any, of the addn. of small percentages of electrolytes to the water used in prepg. clay in such a state of workability for use in power molding machines. A history of the work of numerous investigators on similar problems is given and many references are cited. Two types of plastometers were used for obtaining an index of plasticity; namely the impact plastometer (Vicat needle as is used for obtaining the normal consistency of Port. cements) and constant pressure plastometer. Photos of each app., detailed construction data and operating procedures are given. Close parallelism of results were obtained in using each app., hence the impact plastometer was used for the expts. because of its simplicity and apparently greater accuracy. The behavior of the clay in the presence of the following electrolytes was investigated: $Ca(OH)_2$; H_2SO_4; NaCl; $BaCl_2$; $AlCl_3$; HCl; NH_4Cl; and NaOH. The clay used was a typical brick and hollow ware clay from

Stark County, Ohio and analyzed SiO_2 —63.62%; Al_2O_3 plus Fe_2O_3 —21.30%; CaO —1.40%; MgO —0.72%; H_2O —10.40%. B. concludes from the expts., electrolytes investigated may be grouped into 4 classes. (1) Electrolytes which cause the clay to become more fluid. HCl is in this group. (2) Electrolytes which first make the clay more fluid, while further additions decrease fluidity. NaCl and NaOH are of this group. (3) Electrolytes which first cause the clay to become less fluid until a certain limit is reached, when further addns. affect the clay in the opposite way. NH_4Cl; $AlCl_3$; H_2SO_4 are in this group. (4) Electrolytes which cause decrease in the fluidity. $Ca(OH)_2$ and $BaCl_2$ are members of this group. Under the microscope there seems to be three general classes of constituents in the clay. (1) Cryst. particles, (2) amorphous particles, (3) colloid particles. The first 2 classes remain constant in size regardless of varying degree of fluidity while colloid particles decrease in size with increase of fluidity. B. advances max. dispersion of class 3 is brought about by a certain concn. of anion which is const. for each electrolyte, and if this value is exceeded the clay becomes less fluid. Reverse probably due to attraction between particles being lessened owing to increase in osmotic pressure in interior of clots, thus decreasing amt. of sol present. When this action reaches a certain stage, the sol absorbs the salts, causing increase in fluidity. 1.5% NaCl causes greatest fluidity. J. W. H.

104. Clay-mud. H. CHATLEY. *Soc. of Engineers* (London), June, **1922.**—Properties of clay-mud are discussed. Clay-mud has 3 special features: (1) A granulated structure of varying degrees of fineness. (2) A semi-permanent water content, which gives it peculiar mech. properties. (3) A certain small reserve of chem. potential, which, under certain conditions, will cause it to change in various ways. Methods of observing the granular matter by means of the microscope are discussed, and C. states that the plasticity depends upon the size of the products and the proportion of colloids present. He divides the water content into 3 classes. Clay-mud containing 15% by weight of water has a tensile strength of 15 lb. per sq. in., but doubling the water content reduces the tensile strength to one-third of this amount. With 28% of water, its viscosity is about the same as a heavy grease, corresponding to a shear strain of 1 radian per 100 sec., under a shear stress of more than 100 gm. per sq. cm. It differs from heavy grease, however, in that water is extruded as the pressure is increased. It is not water-tight, and dykes allow water to percolate very slowly, but if the surface of the dyke is dry, the surface tension may arrest the flow. Conclusions conform to the common experience that water content of clay is of great importance, and they also indicate that, as with all other materials, the working stresses should be within the "elastic range." O. P. R. O.

105. Ferric oxide and alumina separated from lime. CHARRIOU. *Compt. rend.* **174,** 750–4(1922).—A sepn. of ferric oxide and alumina from lime may be accomplished in such a way as to prevent the co-pptn. of lime with the ferric oxide and alumina: A soln. contg. 0.56 gr. of calcium oxide, 2 gr. ammonium nitrate and either 0.141 gr. of ferric oxide or 0.166 gr. of alumina is treated with 2 cc. of a soln. contg. 11 mols. of ammonia per liter, the whole dried at a temp. of 150°C approx., so that all the ammonium nitrate may not be decomposed, the resulting mass washed and taken up by decantation with boiling water. To accelerate the process: Dissolve the residue insoluble after two decantations in boiling nitric acid, decomposing it at about 250°C, and taking the residue up in 50 cc. of boiling 5% ammonium nitrate soln., the ferric oxide and alumina will then remain in a dense, granular form capable of rapid washing by decantation. To overcome the difficulty of removing the adherent oxide completely from the dish during the washing; either weigh the dish beforehand and then calcine and weigh the oxides in it, or dissolve the remaining particles of the oxides in nitric acid, reprecipitate with ammonia and filter. The total volume of the washings in all the expts. in which the lime was

subsequently estd. was 500 cc.; the amounts of ammonium nitrate introduced were found to be without influence on the estn. of the calcium as oxalate. O. P. R. O.

106. Colloid chemistry, general and industrial applications. ANON. Dept. Sci. and Indus. Research, *Fourth Rept.*, **1922.**—Colloid chemistry subject matter in these reports is considered under two heads, (1) subjects mainly academic in nature, (2) subjects mainly technical. Each section has been written authoritatively, by a specialist on the subject which he treats. Under the first head are grouped: Colloids in analytical problems, cataphoresis, colloid systems in solid cryst. media, mol. attraction, membrane equilibria, disperse systems in gases, the theory of lubrication, and the application of colloid chemistry to mineralogy and petrology. Under the second head are grouped: Colloid chemistry of soap boiling, flotation processes, catalytic hydrogenation, the rôle of colloids in metal deposition, rubber, and colloid fuels. O. P. R. O.

107. Quantitative analysis of clays. O. BOUDOUARD AND J. LEFRANC. *Bull. Soc. Chim.*, **31,** 1145–52(1922).—Methods for qualitative and rational analysis are given in full with notes. O. P. R. O.

108. Barytes standardization. T. M. LOWRY. *Bull. of Indian Industries & Labour*, **22,** p. 10.—The question of standardization has recently been investigated by T. M. Lowry on behalf of the Assoc. of Br. Barytes Producers. According to the tests generally applied in the mills are those in which the foreman rubs the barytes on his thumb nail and from experience is able to grade the material, or it is rubbed on one hand and shaken on to the other, the grade being determined from the quantity shaken off. Testing with the microscope is more precise, but has limitations by reason of the small amount which can be examined. It is necessary to supplement this information by some further test, therefore Dr. Lowry has evolved a new process of testing powdered barytes in which a current of water traveling at a rate of 7 mm. per sec. is made to carry over the finer particles and leave the heavier ones behind in a graduated tube. With this app., which is simple in construction and easy to work, it is suggested that five standard grades should be recognized and adopted. The percentages of residue for these five grades are: 0.1; 1.2; 2.4; 4.8; 8.16. No satisfactory method of measuring the color of bleached barytes seems to have been devised and standardized and at present it is done entirely by arbitrary visual methods. O. P. R. O.

109. Physical properties of clay. A. S. E. ACKERMANN. *Society of Engineers, Trans.*, **1919–20–21–22.**—Physical properties of clay and the effect of water content upon their properties has been discussed by Mr. Ackermann during the last four years. He describes experiments, and shows that clays, like certain metals, have a certain measure of fluidity. When a disc resting on clay is loaded the disc sinks into the clay, the amount it descends depending on the load and on the time allowed; and when the load exceeds a certain amount, which depends upon the amount of water present, the rate and extent of penetration are considerably increased. The stress at which this occurs he calls the pressure of fluidity. His experiments have been directed toward determining the bearing power of soils, and the load that can be safely applied to them. The American Society of Civil Engineers has issued a series of reports, prepared by a special committee, to codify present practice on the bearing values of soils for foundations, and has emphasized the importance of the colloid content of clay. Most of the grains of the minerals in the clay are enveloped by colloid, but quartz grains do not, as a rule, have the colloid coating. The plasticity of the clay depends upon the amount of colloid present. To separate the colloidal from the granular material, the clay is revolved at 40,000 r. p. m. in a separator. (*Nature*, **111,** 1923.) O. P. R. O.

110. The effect of U_3O_8 upon the fusibility of Zettlitzer kaolin. O. KALLAUNER AND J. HRUDA. *Sprech.*, **55,** 523(1923).—In order to det. the effect of U_3O_8 upon Zettlitzer kaolin mixts. of varying compns. were melted in an electric furnace. The

kaolin had the following analysis: SiO_2 47.39%, Al_2O_3 37.74%, $Fe_2O_3(SiO_2)$ 0.72%, CaO 0.16%, K_2O 0.52%, ignit. loss 13.58%. The different mixts. and their softening points are given below:

Kaolin per cent	U_3O_8 per cent	Cone	Kaolin per cent	U_3O_8 per cent	Cone
100	..	35	50	50	15
99	1	34	40	60	17
95	5	33	20	80	30
90	10	32	10	90	34–35
80	20	31	..	100	35+
60	40	18	..	..	..

H. G. SCHURECHT

111. Research in Georgia clays and bauxite. ANON. *The Clayworker*, **79**, 274 (1923).—Outline of research of certain Ga. clays under a coöperative arrangement with Bureau of Mines is given and embraces whiteware clays, refractory clays, and bauxite, and vitrified face brick. J. W. H.

112. The B. t. u. chart. C. J. LOHMAN, JR. *Chem. Met. Eng.*, **27**, 1031(1922).—This chart is so constructed as to indicate directly the heat value of a fuel, given the corrected temp. rise of the calorimeter, thermometer and the % of moisture in the charge. H. L. O. (*C. A.*)

113. Purification and analysis of zirconium dioxide. F. G. JACKSON AND L. I. SHAW. *J. Am. Chem. Soc.*, **44**, 2712–14(1922).—Fusion for 1 hr. of 1 pt. oxide to 4 pts. of an equal mixt. of borax and soda ash dissolved 60–70%. When the fusion is taken up in dil. HCl the insol. residue cannot be sepd. by filtration. By pptg. the hydroxide with NH_3 the residue was held in this ppt. which could be washed free of borates and chlorides. By repeatedly pouring a slight excess of warm HCl over the ppt. the hydroxide can then be dissolved and the soln. filtered clear. Addn. of a very little H_2SO_4 then pptd. the basic sulfate which could be coagulated by heating nearly to boiling and washed free from Fe and Al. Most of the Ti is pptd. Attempts to det. Zr by volatilization of the fluoride in absence of H_2SO_4 were not successful. Twelve successive treatments with H_2F_2 reduced the residue to 2%. A. R. M. (*C. A.*)

114. A preliminary study of zirkite ore. J. G. THOMPSON. *J. Phys. Chem.*, **26**, 812–32(1922).—Zirkite (baddeleyite) ores are studied with a view to improving their refractory properties by the elimination of certain impurities. 90–95% of the SiO_2 in the raw material may be removed by heating a mixt. of the ore with just enough coke to convert the Si to the carbide, in an electric furnace, to a temp. above 2220°. With C in excess, the removal is incomplete. If the Fe be then removed by treatment with Cl or phosgene, zirconia sufficiently pure for refractory purposes might be obtained. Methods of *analysis of Zr compds.* are briefly reviewed, and a scheme for the detn. of Zr, Si, Fe, and Ti is outlined. E. F. H. (*C. A.*)

115. Surface tension in solids. G. N. ANTONOFF. *Z. physik. Chem.*, **102**, 388–92 (1922); cf. *C. A.*, **13**, 274.—A mathematical relation has been deduced for the internal pressure (P) of solids. From the values obtained for the breaking-load of rock salt crystals it is shown that $P/p^{1/3} = 1.4$ dynes/cm.^{2}, where $p = 1/d^3$ and d is the attraction between the doublets. If the attraction between the charges is not influenced appreciably by the neighboring series (of doublets), the above value for $P/p^{1/3}$ represents the surface tension in the direction of the vertical axis. If the field is sym. in all directions to the equiv. axes, then it represents the surface tension of rock salt in all 3 directions. H. J. C. (*C. A.*)

116. The full effect of variable head in viscosity measurements. F. M. LIDSTONE.

Phil. Mag., **44**, 953–5(1922).—Additional corrections in the treatment of the variable head in viscosity measurements (cf. *Ceram. Abs.*, **1** [8], 198(1922)). S. C. L. (*C. A.*)

117. Film method for measuring surface and interfacial tension. A. W. FAHRENWALD. *J. Optical Soc. Am.*, **6**, 722–33(1922).—The accuracy is discussed of each of the following methods of measuring surface tension: (1) drop wt., (2) capillary rise, (3) Jaeger, (4) vibrating jet, (5) method measuring the tension required to detach a ring, sphere, or disk from the surface of the liquid, and (6) film method. For oil-water emulsions where the surface tension depends upon the age of the surface, the film method gives the most dependable results. The instrument, which essentially consists of a liquid container, knife edge, automatic balance, pointer and scale, is carefully described. A measurement consists in lowering the knife edge into the liquid, then lowering the liquid until the edge is just about to be detached from the liquid. The liquid container is then lowered very slowly until the pointer is seen to slip back a few divisions which indicates the formation of the film. For most liquids the film lasts several seconds holding the pointer motionless at a given point on the scale. With small corrections, this method can be used for any liquid. By substituting a special frame plate for the knife edge, the tension existing at a liquid-liquid surface can be as readily measured as for the previous liquid-air surface. The instrument is standardized to read directly in dynes per cm. with the value of the surface tension of water, 72.8 dynes per cm., as the basis. The instrument is easily constructed and gives values easily reproducible to 0.1 dynes per cm. E. F. P. (*C. A.*)

118. The application of colloid chemistry to mineralogy and petrology. ALEX. SCOTT. *Brit. Assoc. Advancement Sci.*, 204–44, **1922.**—This report treats (I) of the general aspects of colloid chem. applicable to mineralogy and petrology: (1) weathering, (2) cementation, (3) adsorption, (4) determination of colloidal character or origin, (5) dendritic structure, (6) anomalous double refraction, (7) igneous rocks. (II) Rocks and minerals which either exist in colloidal form or are derived from colloidal material: (1) metals, (2) sulfur, (3) carbon, (4) silica, (5) agate, (6) bauerite, (7) chert and flint, (8) siliceous sinter, (9) alumina, (10) Mn oxides, (11) Sb oxide, (12) MgO, (13) Sn oxide, (14) Mo oxide, (15) ice, (16) sulfides, (17) silicates of Al, (18) silicates of Fe, (19) zeolites, (20) serpentine group, (21) other silicates, (22) carbonates, (23) sulfates, (24) phosphates, (25) arsenates, (26) antimonates. A very large number of references are given. J. A. (*C. A.*)

119. The Michell viscosimeter. J. L. *Technique moderne*, **14**, 360–1(1922).—The viscosimeter consists essentially of a metal cup and a metal ball fitting very accurately in the cup. The cup is provided with 3 small projections, so that the distance between the ball and cup is accurately known (of the order of 0.01 mm.). The cup is provided with a hollow handle for the insertion of a thermometer. To carry out a detn., pour a few drops of oil in the cup, place the ball and press it firmly into the cup, reverse the position of the instrument, and note the time required for the sphere to fall. The time multiplied by the const. of the instrument gives directly the viscosity in dynes per cm.^{2} Detns. with this app. agree closely with those obtained with the Redwood viscosimeter. The Michell detns. required two hours and the Redwood nearly two days. The theory of the instrument is briefly explained. A. P.-C. (*C. A.*)

120. The flow of liquids under capillary pressure. E. K. RIDEAL. *Phil. Mag.*, **44**, 1152–9(1922).—A capillary tube of glass 1.2 m. long and 0.708 mm. av. internal diam. was mounted horizontally in a condenser tube maintained at 20°. The liquid under examn. was then drawn back and forth by suction several times to wet the wall thoroughly, and finally was forced back to a point 15 cm. from the beginning of the capillary, from which point measurements were made of the rate of penetration. The liquids examd. were isobutyl, isopropyl, allyl, Et, and Me alcs., water, water-Et alc. mixts.,

$CHCl_3$, C_6H_6, Et_2O, Me_2CO and AcOEt. The rate of advance into the capillary of a liquid under its own force is: $t = (2\eta/\gamma^r)x^2 - (\delta r^2/\gamma\eta)\log x$ in which t is the time, η the viscosity, γ the surface tension, x the distance traversed, and δ the d. of the liquid. For relatively large capillaries the *penetration coeff.* is $\sqrt{\gamma r/2\eta}$. The exptl. detn. of the coeff. is shown to agree with calcn. In the case of mixts. the dynamic surface tension and not the static values are probably the governing factors. The reciprocal of the penetration coeff. is proportional to the sq. root of the period of mol. relaxation as defined by Maxwell, and by analogy with reactions in the solid state is probably important in reactions taking place in liquid media. S. C. L. (*C. A.*)

121. Films. The spreading of liquids and the spreading coefficient. W. D. Harkins and A. Feldman. *J. Am. Chem. Soc.*, **44**, 2665–85(1922).—A theoretical paper in which it is shown that the criterion of spreading or non-spreading of liquids may be presented in a very simple way in terms of a simple and thermodynamically detd. coeff., termed the *spreading coeff.* This coeff. is defined as $S = Wa - Wc$, where Wa is the work of the surface adhesion and Wc the work of the surface cohesion of the liquid. A positive value of S corresponds to spreading, a negative value to non-spreading. Expts. were made with org. liquids on the surface of water and *vice versa*, and with org. liquids and H_2O on the surface of Hg. Almost all org. liquids spread on H_2O, while H_2O spreads on very few org. liquids. The non-spreading of org. liquids on H_2O is brought about by the presence in the org. mol. of Cl, Br, I, =S, =CS, or by Ph groups. Monomol. films are produced on H_2O only when the spreading coeff. has a relatively high value. These high values seem to occur only when the spreading substance has a polar group in its mols. H. J. C. (*C. A.*)

122. A molybdenum resistance vacuum furnace. P. Fleury. *Compt. rend.*, **175**, 880–2(1922).—Molybdenum wire is wound on an alundum core and surrounded by alundum. This is sealed in a vacuum iron case. The furnace can be used to 1700°. A. H. D. (*C. A.*)

123. Identity of amorphous and crystalline silicon. W. Manchot. *Z. anorg. allgem. Chem.*, **124**, 333–4(1922); cf. *Ceram. Abs.*, **1** [8], 206(1922).—X-ray examn. of the 2 forms of amorphous Si by Debye has shown them to be cryst. and to have the same diamond-like structure as the ordinary form. M.'s assumption that the differences in chem. properties shown by these forms were due solely to greater ratio of surface to mass is thus firmly established. The following additional observation on the chem. behavior of these pseudo-amorphous varieties is appended. When the black variety, obtained by quenching its soln. in metals, is rubbed with PbO_2, it flames vigorously even in the cold while the yellow-brown variety obtained by action of H_2F_2 on the black variety explodes violently when rubbed with PbO_2. A. R. M. (*C. A.*)

124. Simple apparatus for comparing the thermal conductivity of metals and very thin specimens of poor conductors. M. S. Van Dusen. *J. Optical Soc. Am.*, **6**, 739–43 (1922).—The method consists in comparing the temp. gradients in two materials placed in series, the rate of flow in each being the same. App. for this investigation is fully described and data are given for contact material including dry boundary, contact water, mineral oil, and various thicknesses of paper and mica, between two horizontal cylinders. The thermal conds. of Zn, Al, Sn, Pb, and Navy brass detd. in this app. check previous values in every case within 5%. E. F. P. (*C. A.*)

125. A problem in viscosity: The thickness of liquid films formed on solid surfaces under dynamic conditions. Research Staff of the General Elec. Co., London. (Work conducted by F. S. Goucher and H. Ward.) *Phil. Mag.*, **44**, 1002–14(1922).—The detn. of the thickness of the liquid layer coating a solid body drawn out of a liquid is discussed theoretically and practically. It is shown that if the solid is a flat slab of infinite width, the forces detg. the thickness are those of gravity (g) and viscosity (η)

and the relation between thickness (t), density (ρ), and the velocity of drawing v_0 is: $t^2 = 2v_0\eta/\rho\ g$. If the solid is a fine wire of radius r, surface tension is dominant and gravity negligible. If γ is the surface tension, the relation must be of the form: $t/r = f(\eta v/\gamma)$. It is found empirically that $f(\eta v/\gamma)$ is of the form: $4.8\ \eta v/\gamma$ in c. g. s. units. These results apply to suspensions if, (1) the diam. of the suspended particles is not greater than t, (2) if the effect of the particles in increasing η is taken into account. There is no evidence of any special cohesion between solids and liquids wetted by them other than that which prevents slipping at the interface. S. C. L. (*C. A.*)

126. Colloidal systems in solid crystalline media. CECIL H. DESCH. *Brit. Assoc. Advancement of Sci.*, 4th Report, 33–40, **1922.**—The first part reviews some of our present knowledge on the colloidal dispersion of some of the constituents of *steel* and *alloys*, and even the *iso-colloidism of pure metals*. Since "the dimensions of the grains are considerably above the limits which are usually assigned to the colloidal state, it is unlikely that any advantage would be gained by including this aspect of the structure of metals under the heading of colloid chemistry." [This is erroneous, because the effects of subdivision transcend the limits mentioned. Besides, visible grains, metals and alloys contain in addition truly colloidal particles. J. A.] A brief very incomplete section on the "*Coloring Matters in Crystalline Minerals*," is also included.

J. A. (*C. A.*)

127. A small high intensity mercury arc in quartz glass. L. J. BUTTOLPH. *J. Optical Soc. Am.*, **6,** 1066–71(1922).—This illuminator is a self-contained unit furnished to operate on 110 v. either a. c. or d. c. The effective light source has an area of $^1/_4'' \times 1^3/_4''$ and is provided with a removable mica filter for absorption of extreme ultra-violet, an adjustable slit, and a light-tight holder for filters. By use of Cornings G555P and G34 glasses λ 5461 may be isolated; or by use of Noviol A and G 585 glasses λ 4359 may be obtained as monochromatic light sources. By use of Wratten filters other lines may be isolated. The instrument has two operating conditions. With enough resistance in series it is a low pressure arc giving only the strongest spectrum lines, and if operated at highest intensity it changes to a high pressure arc giving a continuous spectrum with additional Hg lines. D. E. S. (*C. A.*)

BOOKS

128. Tested Methods of Non-Ferrous Metallurgical Analysis. SEYMOUR PILE AND REGINAL JOHNSTON. London: H. F. and G. Witherby. 128 pp. 7s. 6d. Reviewed in *Chem. News*, **125,** 208(1922); *Chem. Trade J.*, **71,** 396(1922) and *Chem. Age* (London), **7,** 492(1922). (*C. A.*)

129. The Chemical Analysis of Rocks. H. S. WASHINGTON. 3rd Ed. Revised and enlarged. New York: John Wiley & Sons, Inc. 271 pp. $2.50 (12s. 6d.) (*C. A.*)

130. Handbook of Chemical Engineering. 2 Vols. Edited by Donald M. Liddell. New York: McGraw Hill Book Co. $8. Reviewed in *Chem. Met. Eng.*, **27,** 1184 (1922). (*C. A.*)

131. Textbook of Chemical Engineering. EDWARD HART. 2nd Ed. revised. Easton, Pa.: Chemical Publishing Co. 241 pp. $4. Reviewed in *Chem. Met. Eng.*, **27,** 757(1922). (*C. A.*)

General

132. Largest brick plant in the world. ADDIE M. WALLACE. *The Clayworker*, **79,** 146–49(1923).—Description and photos of Simons Brick Co. various plants at Los Angeles, Calif. and vicinity. J. W. H.

133. Common Brick Manufacturers' Association meeting. ANON. *The Clay-*

worker, **79**, 140–42; 170(1923).—A review of C. B. M. A. convention held in Cleveland, Ohio, Feb. 5, 6 and 7. J. W. H.

134. National Brick Manufacturers' Association convention. ANON. *The Clayworker*, **79**, 125–38, 237–73, 288, 290, 292(1923).—Verbatim report of 37th annual convention of N. B. M. A. held in Cleveland, Ohio, Feb. 7, 8 and 9. J. W. H.

135. Hollow Building Tile Association convention. ANON. *The Clayworker*, **79**, 152–3(1923).—A review of the 5th annual meeting of H. B. T. A. held in Chicago, Ill., Jan. 25 and 26. J. W. H.

136. Silver jubilee convention of The American Ceramic Society. ANON. *Brick and Clay Record*, **62**, 319–22, 352–4, 356–8(1923).—A report of convention activities and the salient points of papers presented in the various divisional meetings. J. W. H.

137. Common Brick Manufacturers' Association convention. ANON. *Brick and Clay Record*, **62**, 310–5(1923).—Report of annual convention at Cleveland, Ohio, Feb. 5–7. J. W. H.

138. National Paving Brick Manufacturers' Association convention. ANON. *The Clayworker*, **78**, 559(1922).—A review of the annual meeting held Dec. 12 and 13, at Cleveland, Ohio. J. W. H.

139. Silver jubilee convention of American Ceramic Society. ANON. *The Clayworker*, **79**, 150–1, 172, 181–2, 184.—A review of the 25th annual convention held in Pittsburgh, Pa., Feb. 12–16. J. W. H.

140. Annual meeting of New Jersey Clay Workers' Association and Eastern Section of American Ceramic Society. L. W. ALLISON. *Brick and Clay Record*, **62**, 48(1923).—A report of the annual meeting held at Rutgers College which includes salient points of papers delivered in symposiums on casting of ceramic wares and oil burning. J. W. H.

141. Annual convention of Hollow Building Tile Association. ANON. *Brick and Clay Record*, **62**, 210–3(1923).—A report of H. B. T. A. convention at Drake Hotel, Chicago, Ill., Jan. 25 and 26, 1923. J. W. H.

142. Canadian convention. ANON. *Brick and Clay Record*, **62**, 218–9(1923).—A report of joint convention of Canadian National Clay Producers' Association and The Western Ontario Clay Workers' Association in Hamilton, Ontario, Jan. 23–25. Plant problems constituted the major part of the program. J. W. H.

143. American Face Brick Association convention. ANON. *Brick and Clay Record*, **61**, 858–62(1922).—Report of convention at West Baden Springs Hotel, West Baden, Ind., Dec. 5–7, 1922. J. W. H.

144. Cleveland, a clay center. ANON. *The Clayworker*, **79**, 23–34(1923).—A description of 18 clay products plants located in Cleveland which produce common, face and paving brick, sewer pipe and hollow tile. Also unusual features in equipment and methods of operation. J. W. H.

145. American Face Brick Association convention. ANON. *The Clayworker*, **78**, 546–51(1922).—A review of the annual meeting of the A. F. B. A. at West Baden. J. W. H.

146. A refractory survey (proposed). ANON. *The Clayworker*, **78**, 568(1922).—A contemplated survey sponsored by the Refractories Manufacturers' Association. The purpose of which is to uncover a mass of information with regard to furnace conditions as in actual service. Progress reports will be made as information is gathered. J. W. H.

147. Research bureau laboratory, Standard Steel Car Co. RICHARD RIMBACH. *Chem. Met. Eng.*, **28**, 110(1923). E. J. C. (*C. A.*)

148. The electric steam generator. HORACE DREVER. *J. Ind. Eng. Chem.*, **14**, 923–5(1922).—The elec. generation of steam by passing a. c. (usually high tension)

directly through the water is economical for utilization of off-peak power and is generally profitable in localities where hydroelectric power is abundant but fuel is expensive. An elec. steam generator of 1000 kw. capacity is equivalent to a boiler of 100 h. p. (cf. also *Elec. World*, **80**, 1211–2(1922)). L. J. (*C. A.*)

149. Some recent developments of powdered-coal firing. J. S. ATKINSON. *Iron Coal Trades Rev.*, **105**, 924–7(1922).—The prepn. and utilization of powdered coal are discussed in connection with its drying, pulverizing, burning, and the removal of the ash. The turbo-pulverizer is especially recommended (cf. *C. A.*, **16**, 1001). Under usual working conditions an efficiency on boiler, superheater and economizer of 86% can be obtained and maintained with pulverized coal. J. L. W. (*C. A.*)

150. Gasification of Ohio coals. D. J. DEMOREST. *Chem. Met. Eng.*, **27**, 1172–5, 1221–4(1922).—The suitability of Ohio coals for gas manuf. was studied in a vertical retort of commercial size. The methods of operation of the retort and various methods of control analyses are also given. The data are tabulated and discussed. Coke suitable for domestic heating but inferior for metallurgy was obtained. A little less tar and about the same amts. of NH_3 were produced as from standard gas coal. About the same vol. of gas as from standard gas coal but with lower calorific value was obtained. W. A. M. (*C. A.*)

151. The commercial application of electroösmosis. J. H. FRYDLENDER. *Rev. prod. chim.*, **25**, 721–30(1922).—A review of the theoretical principles of electroösmosis and electrophoresis and of their application to drying peat, purifying and molding clay and kaolin, prepn. of colloidal SiO_2, purification of tan liquors, tanning of hides, sterilizing and improving foodstuffs, preservation of green fodder, purification of glues and gelatins, prepn. of pure serums, extn. of sugar from molasses, decolorizing sugar juices, purification and elimination of alkaloids, purification of crude glycerol, prepn. of $Al(OH)_3$, and dehydration of coloring matters. The article is based very largely on the patent literature. A. P.-C. (*C. A.*)

152. Powdered coal as fuel in steam plants. H. KREISINGER AND J. BLIZARD. *Proc. Eng. Soc. Western Penn.*, **38**, 169–200(1922).—Three groups of tests using powd. coal on a 3-pass Edge Moor boiler equipped with a "Lopulco" furnace and the results of a 9-day test on 2 Stirling boilers are reported. Overall thermal efficiencies of from 80% to over 90% were obtained. Drawings of furnace settings, the burner for powd. coal, the isothermal lines in operation of a furnace burning powd. coal, together with graphs showing the % CO_2, excess air, temp. of flue gas and uniformity of furnace conditions with variable load are given. Prevention of the destruction of furnace lining by high temp., easy removal of ash, effect of a water screen in the furnace and recent improvements in furnace design are discussed. Much valuable information comparing stoker fired furnaces with those burning powd. coal is contained in the extended discussion which follows the article. W. W. H. (*C. A.*)

153. The protection of brass weights. J. J. MANLY. *Phil. Mag.*, **44**, 948–50 (1922).—A modification of a method first used by Faraday to protect Fe from rust, is applied to brass wts. The wts. are tooled to remove tarnish, polished, heated in a semi-luminous gas flame until nearly red hot and then plunged into boiled linseed oil and left to cool. After removal and washing with turpentine and polishing with old linen, the wts. are adjusted, standardized and put into use. Modern coal-gas contains too much S for direct heating, and it was found necessary to use a vitreosil crucible with lid or a muffle. After cleansing and polishing each wt. is covered with a thin layer of linseed oil and then placed on a 3-point porcelain support in the crucible or muffle just above a layer of asbestos. Heat is applied until a golden tint is observed, when the heating is ended and after cooling an even coating is obtained which weighs about 0.05 mg. per sq. cm. of surface. S. C. L. (*C. A.*)

154. Commercial electro-thermic processes. II. BRUNO WAESER. *Chem.-Ztg.*, **46,** 928–30(1922); cf. *Ceram. Abs.*, **2** [2], 19(1923).—The methods of *fusing silica* and the use of elec. furnaces in *melting and mfg. Fe and Fe alloys* are briefly surveyed. Among the alloys of Fe are included those with Si, Mn, Al and Ti. **III.** *Ibid.*, 947–8.—The *manuf. of ferro-Cr, ferro-Ni and ferro-Mo, CaC_2, Al, P and CS_2* are briefly reviewed. Numerous places are mentioned at which the processes are being carried out. **IV.** *Ibid.*, 970–2.—Brief review of *Zn melting and refining, manuf. of cement and steel;* use of elec. heating in *coal distn., fixation of N_2* in the arc; and elec. *steam generation.*

M. K. (*C. A.*)

155. The control of works operations by scientific instruments. LEONARD LEVY. *Chem. Age* (London), **7,** 734–7(1922).—A brief outline of the application to works control of the X-ray tube, refractometers, spectrometers, viscosimeters, pyrometers and the like. W. H. B. (*C. A.*)

156. Earning power of research as demonstrated by the experience of the American Rolling Mill Company. D. M. STRICKLAND. *Ind. Eng. Chem.*, **15,** 78–9(1923).—By adequate support of a no. of research problems, it is contended that at least 1 problem will be successfully solved and repay the entire research expense. C. C. D. (*C. A.*)

BOOKS

157. Filtration. T. ROLAND WOLLASTON. London: Sir Isaac Pitman & Sons, Ltd. 102 pp. 2s. 6d. Reviewed in *Chem. News*, **125,** 270(1922). (*C. A.*)

158. Discoveries of the Twentieth Century. EDWARD CRESSY. London: Routledge & Sons, Ltd. 12s. 6d. Reviewed in *Chem. Trade J.*, **71,** 770(1922). (*C. A.*)

159. The Wonder Book of Chemistry. JEAN H. FABRE. Translated from the French by Florence C. Bicknell. New York: The Century Co. 385 pp. $2.50. Reviewed in *Am. J. Pharmacy*, **95,** 65(1923). (*C. A.*)

160. Scientists' Reference Book and Diary, 1923. Manchester: Jas. Woolley Sons & Co., Ltd. 174 pp. 3s. 6d. Reviewed in *Pharm. J.*, **109,** 563(1922). (*C. A.*)

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Abrasives

PATENT

1. Safety-tread tile. M. F. Beecher. U. S. 1,439,285, Dec. 19. Si carbide granules forming the main portion of the tread surface of tiles are united into an integral porous mass by a porcelanic bond. Cf. *Ceram. Abs.*, **1** [3], 82(1922). (*C. A.*)

Art

2. Uranium protoxide in Czecho-Slovakia. Anon. *Jour. Royal Soc. Arts*, **71**, 258.—Oxide of black blende, or pitch ore, otherwise known as protoxide of uranium is one of the valuable minerals obtained at the State mines of Jachymov in W. Bohemia, according to a rept. by the U. S. Consul at Prague. This mineral is used in the prepn. of uranium colors and radium, owing to the fact that the Czecho-Slovak Govt. has a monopoly of the production of radium and other precious minerals, a special permit is necessary for their purchase. O. P. R. O.

3. Art and its application to the pottery industry. Anon. *Pottery Gaz.*, **48**, 106–8 (1923).—A rev. of an address by Joseph Burton. J. W. H.

4. Ceramics in the field of architecture. Arthur Beresford Pite. *Pottery Gaz.*, **47**, 736–8(1922).—An address. J. W. H.

5. Lustered pottery: ancient and modern. Gordon M. Forsyth. *Pottery Gaz.*, **48**, 95–7(1923).—F. classifies lustered pottery into 2 classes, namely true lusters fired in a reducing atmosphere and false lusters fired in ordinary atm. in a muffle furnace. Historic side of luster decorations is given. Process of applying luster and method of firing is outlined. J. W. H.

6. Classifying and measuring color by the Ostwald method. H. T. Tenen. *Am. Dyestuff Rep.*, **12**, 127–32(1923). E. J. C. (*C. A.*)

Cement, Lime and Plaster

7. Waterproofing cement. Anon. *Chem. Age* (London), **8**, 238(1923).—"Kynazite," a prepn. for waterproofing cement and mortar, has been tested at the College of Tech., Manchester, with good results. This substance is used to replace a propn. of the sand used in manuf., and according to the tests proves an effective waterproofer of mortar and cement in all cases, even for water under pressure, the imperviousness being increased by increasing the propn. of the product. The strength of the materials as detd. by compression tests was found to be slightly greater than ordinary cement and mortar. Concrete made with kynazite replacing the whole of the sand content was found to be highly water resisting, but in this case the strength was only about 50%

of that of plain concrete. It is manufd. by Kynaz Products Co., Ceinws, Montgomeryshire, Eng. O. P. R. O.

8. German research institute for slag-cement. ANON. *Jour. Soc. Chem. Indus.*, **42**, 306.—The Ger. slag-cement indus. has now gained a position of equal importance with the Port. cement indus. and a new Research Institute has been formed and opened at Düsseldorf. O. P. R. O.

9. The production of caustic calcined magnesite in the Scott furnace. W. C. RIDDELL AND C. N. SCHUETTE. *Eng. Mining J.*, **114**, 981–4(1922).—The Scott fur. (commonly used to treat fine mercury ores) is described. Such fur. has been successfully used since 1920. Producing caustic magnesia for use in Sorel cement. Figures on cost and opern. given. Also data on rate of decompn. of different magnesites. S. L. G.

10. Setting and velocity of solution of burnt gypsum. P. P. BUDNIKOV AND JA. K. SYRKIN. *Bull. Inst. Polyt. Ivanovo-Voznesensk.*, **6**, 235–47(1922).—The authors have investigated the velocities of dissolution of gypsum after the latter had been heated at various temps., the concns. being detd. at different stages of the dissolution by means of cond. measurements. For the samples which have been heated at 115° and 125°, the cond. and hence the soly. increases rapidly to a point corresponding with a soln. considerably supersatd. with respect to $CaSO_4.H_2O$, and afterwards diminishes, at first rapidly and then slowly, but still indicates a certain degree of supersatn. after 24 hrs. Supersatd. solns. are obtained also with gypsum heated at 400°, but not when a temp. of 500° is reached. In so far as the setting of gypsum is conditioned by crystn. from supersatd. solns., the temp. at which "dead-burnt" gypsum is formed may therefore be assumed to be about 450°. Burnt gypsum may be regarded as consisting of two components, one sol., which dissolves readily, and the other relatively insol. The soly. of samples which have been burnt at temps. between 500° and 800° is rapid at first, this being explained by the presence of appreciable proportions of the sol. modification in dead-burnt gypsum. The time occupied by dissolution does not furnish an exhaustive explanation of the disappearance of the ability of gypsum to set, and the authors suggest that the presence of the insol. component in the interstices of the crystals prevents the latter from growing. J. C. S. (*C. A.*)

PATENTS

11. Cement mixture. F. FERRARI. U. S. 1,444,309, Feb. 6. A cement mixt. (adapted for withstanding sea water or water containing sulfates) is prepd. by grinding pozzuolanic substances and a special cement contg. Fe_2O_3 and Al_2O_3 free of aluminates and ferrites of Ca, proportioned according to the amts. of available CaO and sand in practical use. (*C. A.*)

12. Elastic cement. W. T. GODDARD. Can. 227,950, Jan. 16, 1923. A cement contains a non-friable aggregate, part of which is initially coated with rubber. Cf. *Ceram. Abs.*, **1** [7], 193(1922). (*C. A.*)

13. Elastic cement. RISSYO TAKAHASHI. Japan. 40,020, Sept. 10, 1921. Thirty parts of soln. of $Al_2(SO_4)_3$ or $BaCl_2$ of 12°Bé. is gradually added to a mixt. of $BaSO_4$ 100 and Turkey red oil 30 and thoroughly mixed together; the insol. elastic substance sepd. from them is completely washed with H_2O and dried *in vacuo*. It is then used for replenishment or manuf. of plastic materials. (*C. A.*)

14. Waterproof tile. MANZO SUGIZAKI. Japan. 40,080, Sept. 28, 1921. Tile prepd. from mortar or cement is heated to about 120°, painted with Japanese lac and then covered with Cu powder. It is once more heated at about 120°. It is resistant to heat and H_2O. (*C. A.*)

15. Continuous updraft vertical shaft lime kiln. V. ARNOLD. U. S. 1,439,597, Dec. 19. (*C. A.*)

16. Magnesia plaster. R. YAMAMOTO. U. S. 1,436,747, Nov. 28. Asbestos or other fibrous material 10, is mixed with MgO 40, pigment 5, powd. peanut shells 5 and a concd. soln. of $MgCl_2$ 44°Bé. dissolved in dil. $Pb(OAc)_2$ soln. 2 parts, to form a plaster which is rendered relatively non-hygroscopic. (*C. A.*)

17. Bricks. C. L. NORTH. U. S. 1,440,234, Dec. 26. Bricks are molded from a mixt. of ground clinker and ash from a coal furnace, lime and H_2O, and are cured with steam under pressure. (*C. A.*)

18. Building block composition. C. A. FOX. U. S. 1,442,764, Jan. 16. A heated mixt. of earthy and oleaginous materials such as earth and asphalt is extruded from a die press and cut into building blocks. (*C. A.*)

19. Floor covering material. W. E. SUMNER. U. S. 1,442,012, Jan. 9. A floor covering material is formed of a waterproofed flexible substance, *e. g.*, felt impregnated with asphalt, with an underlying layer of a mixt. of montan wax, rosin, paraffin and pigment. (*C. A.*)

20. Plaster wall board. J. W. EMERSON. U. S. 1,439,954, Dec. 26. A plaster board is formed largely of plaster of Paris reinforced near its surface with wire cloth or similar material and waterproofed by a gypsum and stearate mixt. (*C. A.*)

21. Strengthening composition for cement mixtures. A. T. MALMED. U. S. 1,436,276, Nov. 21. A mixt. of diatomaceous earth and $CaCl_2$ or similar materials is used for strengthening port. cement concretes and mortars. (*C. A.*)

Enamel

22. Origin of chamotte. ANON. *Brit. Clayworker*, **31**, 371.—There have been many discussions as to the nature of "chamotte" and the origin of this term, and it was for long thought to be derived from "chamois," the cream color of lightly burned fire-bricks having some resemblance to chamois leather. More recent researches in Germany seem to show a much earlier origin, and suggest that the word was originally "Schlam-motte" meaning burned mud. One of the earliest uses of the work (then spelled "Cha-motte") is in a document in connection with the Brueckeberger Porcelain Works, in 1793; in this document it relates, as now, to broken saggers used as grog. (*Tonindustrie Zeitung.*) O. P. R. O.

23. Cleaning enamel. ANON. *Oil & Color Trade Jour.*, **63**, 308(1923).—Paste for cleaning metal, horn, enamel, etc. (German pat. 337,066, C. A. R. SAMSIOE, Stock-holm.) This paste consists of a mixture of bicarbonate of soda and glycerine, with which may be incorporated coloring, flavoring, and perfuming agents. Being sol. in water, the paste can be readily washed off after use. O. P. R. O.

PATENT

24. Enamel-coated writing tablets. R. ZULAUF. U. S. 1,438,154, Dec. 5. A first enamel coating of ordinary compn. is applied to sheet Fe and "stoved" and a finish-ing enamel is then "stoved" upon the first coat. The finishing coat is prepd. by grinding a fused enameling mixt. of ordinary compn. with a considerably larger addn. of clay than usually employed. This second coat gives a dull or mat finish. (*C. A.*)

Glass

25. Simpson continuous leer conveyor. ANON. *Glass Worker*, **42** [21], 19(1923).—Parts, construction and opern. of continuous leer developed by Simpson Foundry and Engineering Co., detailed briefly. R. J. M.

26. Decorating table glassware in colors. ANON. *Glass Worker*, **42** [23], 19 (1923).—How ware is decorated at Factory D, U. S. Glass Co. Color applied by spray or by hand and fired in a decorating leer. R. J. M.

27. Standard milk bottles. ANON. *Glass Worker*, **42** [23], 25(1923).—Laws in various states are not uniform as to size, shape and marking on bottles, hence much unnecessary expense in manuf. 23 sizes of caps are in use to-day. R. J. M.

28. Glass industry (Ceylon). ANON. *Pottery Gaz. & Glass Trade Rev.*, **48,** 419(1923).—A sand, which is of excellent quality and highly suitable for making glass, has been discovered in Ceylon, and a factory for its utilization is now being erected at Henaralgoda, about 20 mi. north of Colombo. M. N. Maru, a Japanese, has left for home to obtain the machines necessary for the factory. Considering the large import trade in glassware, the prospects are good provided coconut shells can be used as fuel, as coal is dear and scarce, and the coconut shells are available in large quantities at cheap prices. O. P. R. O.

29. Non-shattering glass. ANON. *Chem. Trade Jour. and Chem. Eng.*, **71,** 456 (1922).—A newly patented glass that does not shatter consists of alternate plates of thin glass and celluloid, treated with a solution of fusel oil, camphor, and methyl salicylate. The assembled laminae are immersed in the solution at a temperature of 75–95°, and pressure is applied to the whole as the temperature is gradually increased, thus firmly cementing the plates together. O. P. R. O.

30. Glass furnace temperatures. LOESER. *Keram. Rundsch.*, **30,** 48(1922).—The detn. of temp. which was reported was made with materials furnished by a German gold and silver ore establishment, on the m. p. of fusible cones and pure salts. In the flame of a Nehse-Dralle fur. of the basin system, a temp. of from 1600° to 1650° was detd. On the surface of the glass the temp. ran from 1497° to 1526°. In the two flues, one recorded a temp. of 1320°, the other 1385°. O. P. R. O.

31. Mirror glass industry (France). ANON. *Jour. Royal Soc. Arts*, **71,** 258 (1923).—The Fr. Mirror Glass Indus. will have regained its former importance within a year or two, according to competent authorities. A thoroughly modern factory is under construction at Compiégne, near Paris, and reconstruction work at Circy is progressing rapidly. O. P. R. O.

32. Effect of alumina in retarding the devitrification of glass. K. KAMITA. *Pottery Gaz.*, **47,** 1369(1922).—The expts. reported in this paper are confined to window glass. Alumina was added in progressive series from 0.0% to 5.0%. A definite increase in the devitrification temp. was obtained as the percentage of alumina began. A regular curve was obtained indicating that with 5% alumina, incipient devitrification set in above 850°C. The expts. did not include the effect that alumina had upon the upper devitrification temp. J. W. H.

33. The mixing of batch. W. E. S. TURNER, V. DIMBLEBY AND A. W. DICKENSON. *Pottery Gaz.*, **47,** 1033, 1035, 1037(1922).—Authors discuss mixing of glass batch. Attention should be directed to having ingredients introduced at a uniform size, to the d. of the particles and the moisture content must be considered. Machine mixing produces a more homogeneous finished product than is generally obtained by hand mixing. J. W. H.

34. Process of manufacturing optical glass. J. DESENBERG. *Jour. Soc. Chem. Indus.*, **42,** 184A(1923).—A recent Ger. patent. A melt differing in av. compn. is solidified and powdered. Melts similarly treated but differing in compn. both from the previous melt and from that of the prescribed glass are added. Alternatively individual components of the glass may be added. In either manner a mixt. approx. as nearly as possible in average compn. to that of the prescribed glass is produced and melted. Waste glass may be used up in this manner, and a good yield of glass of definite optical properties obtained. O. P. R. O.

35. Improvements in the design of recuperative glass pot furnaces. T. TEISEN. *Pottery Gaz.*, **48,** 89–92(1923).—A description of a recuperative glass pot fur. of the

author's design. One of the advantages of this design was increased security against leakages obtained by the crosswise arrangement of air channels in relation to waste gas channels as well as an interlocking principle on which the tubes are made. J. W. H.

36. Processes and methods of mediaeval glass paintings. J. A. KNOWLES. *Pottery Gaz.*, **47**, 1685–8(1922).—Rev. of an address by J. A. Knowles. J. W. H.

37. Devitrification caused upon the surface of sheet glass by heat. Y. AMENOMIYA. *Pottery Gaz.*, **47**, 1369(1922).—Results of expts. with sheet glass show that devitrification takes place more and more rapidly as the temp. is increased within the zone of 700° to 800°C and that this particular temp. range constitutes the danger zone in the drawing of sheet glass cylinders. Cf. *Ceram. Abs.*, **1** [11], 290(1922). J. W. H.

38. The production of colorless glass in tank furnaces. W. E. S. TURNER AND A. COUSEN. *Pottery Gaz.*, **47**, 568–70(1922); **48**, 87, 89(1923).—Results of a study of effect of selenium in decolorizing a soda lime glass under varying conditions. The batches under consideration are as follows:

Sand	100	100	100	100
Soda Ash	37	36	35	33
Limespar	20	20	20	20
Sodium Selenite	0.0065	0.0065	0.0065	0.0065
Selenium	0.003	0.003	0.003	0.003
Cobalt Oxide	0.0005	0.0005	0.0005	0.0005

All meltings were held at temp. of 1370–1380°C for 3 to $3^1/_2$ hrs. It was found (1) the max. percentage of iron oxide in the glass which it was found possible to decolorize, either with selenium or sodium selenite, was 0.09 with a further allowance of possible 0.01 for commercially produced glass; but the smaller the iron oxide content, below 0.09, the better was the glass in appearance. (2) Presence of saltcake, even in very small amts. in the batch called for an increased amt. of selenium for decolorizing purposes. (3) Saltcake batch appeared to be more corrosive on the fire clay material than the corresponding soda ash batch; hence the amt. of iron oxide content in the glass increased and decolorizing became more difficult. (4) There was evidence of the reaction of selenium with saltcake at high temp. and this tended towards the formation of a colorless compd. in the glass. (5) Sodium selenite was found more effective than selenium, and even $^1/_{32}$ of an ounce was found to be more than sufficient for decolorizing under ordinary conditions. Same melts were performed in lined pots. Lining consisted of china clay (iron content 0.7%) and 5% feldspar. The resulting melts had an iron oxide content no greater than 0.05% in 3 hrs. and 0.09% from 8 to 9 hrs. Arsenious oxide was added in some cases. The results obtained are summarized as (1) it seems evident that arsenious oxide and salt cake both act in same way, *viz.*, to reduce the excess color due to selenium, even when the selenium is present in fairly large amts. (2) This effect, apparent at the end of three hrs. continues for at least $8^1/_2$ hrs. at 1300 to 1400°C. (3) Used alone, selenium or sodium selenite, at any rate in amts. normally employed for decolorizing, would give the yellowish brown color noticeable at 1300°C but more pronou nced at 1400°C; but the presence of arsenious oxide or saltcake alone, or probably even the 2 together, tends to prevent formation of this color. (4) Sodium nitrate, contrary to expectations, increases the color of selenium on melting for 3 hrs. and tends toward production of a pink tint. Longer melting gives an increase of the yellowish brown color, and after $8^1/_2$ hrs. but little difference between the soda ash batch and nitre batch can be observed. It is unnecessary to exclude sodium nitrate from a batch for a selenium decolorized glass. J. W. H.

39. The manufacture of white flint glass in a tank furnace. F. W. ADAMS. *Pottery Gaz.*, **47**, 1031–3(1922).—The large market for white flint glass is that of food con-

tainers. Observations of manuf. of white flint glass in a 110 T. tank capable of 25 T. as a nominal output per day. Suitable tank is essential in production of white flint glass; tank must be sufficiently long and deep for melting and fining to be complete. Ends of tank must be large enough to permit metal to settle and attain uniform viscosity. Attention must be directed to quality of tank blocks—in general the higher the percentage of soda in the batch the higher should be the Al_2O_3 content of the block. MnO_2 and selenium are 2 substances in general use as decolorizers. The merits of these are discussed. Temp. of 1350–1400°C gives good results for white flint mixt. intended for automatic working. A. summarizes as follows: Complete analyses should be made of all batch materials especially the decolorizer. Total iron content in finished glass must be maintained constant; fresh components of metal should be checked regularly by complete analyses; careful weighing and efficient mixing of batch ingredients is essential; melting temp. should be kept constant by use of pyrometers; leer temp. should be correctly ascertained for a given type of glass and maintained constant by a temp. recorder. Advisable to have two recorders in leer to maintain a definite temp. gradient. Articles differing greatly in wt. should not be placed in same leer. When correct amt. of decolorizer has been found for batch with given amt. of iron content in total mix and with due regard to fur. conditions then the remaining variables could be stabilized. For discussion of this paper see *Pottery Gaz.*, **47**, 1208–10(1922). J. W. H.

40. Heat resisting glasses. W. E. S. Turner. *Engineering*, **115**, 274(1923).—In a recent lecture before the Royal Soc. of Arts, T. dealt with the problem of the need for glasses capable of withstanding sudden changes of temp. without fracture, experienced in many industries, notably those requiring miners' lamp glasses, water gage glasses, etc. He pointed out that expts. had been made chiefly in the direction of treatment of the glass after manuf. in a manner somewhat similar to that now adopted by metallurgists for the heat treatment of steels. Owing to the uncertainty of the effects obtainable, the results had been unsatisfactory. The problem has now been attacked from another direction, investigation showing that the "thermal endurance" of a glass varied inversely as the coeff. of expansion, which in its turn is dependent upon the chem. compn. Further researches showed that the use of B_2O_3 and SiO_2 lowered the coeff. of expansion, and in "Pyrex" 11.90% B_2O_3 and 80.62% SiO_2 are used, which give a coeff. of expansion of 37.2×10^{-7}, whereas an ordinary silica-lime glass is about 100×10^{-7}. A drawback, however, is the difficulty of manuf. due to the high melting temp. necessary and the very short range of plasticity; this has led to the investigation as to the possibility of using the oxides of zirconium, thorium and titanium. Up to the present results show that although glasses produced possess greater mech. strength, at the same time they also introduce additional disadvantages. A discussion followed in which the suggestion was made that the introduction of TiO_2 in quantities up to 5% increases the workability in the blow-lamp flame and also that the use of the oxide of thorium increases the range of plasticity. Pure fused silica has advantages in that it has a coeff. of expansion only one seventh of "Pyrex." O. P. R. O.

41. A glass-metal joint. M. L. Dundon. *J. Am. Chem. Soc.*, **45**, 716–7(1923).—A successful method of joining soft glass and Cu and Cu-plated steel tubing is described. E. J. C. (*C. A.*)

42. Anomalies in the expansion of glasses. Pierre Lafon. *Compt. rend.*, **175**, 955–8(1922).—The curves showing the expansion of glass may be divided into 4 parts: (1) a linear part giving the ordinary coeff. of expansion; (2) a part in which irregular effects occur owing to annealing; (3) a reversible change of vol.; (4) a part in which the glass becomes soft and finally molten. It is claimed that the reversible change (3) is due to an allotropic change in the amorphous silica similar to that which takes place in melted S. E. D. W. (*C. A.*)

43. The problem of carboy closure. ANON. *Chem. Met. Eng.*, **27**, 1267–8(1922).—Carboys with chipped or cracked necks may be reclaimed by grinding the necks sufficiently to make the surface smooth. The app. is illus. and its operation explained. The smooth surface means a saving of plaster of Paris; it is cleaner; better closure is obtained; and disputes between buyer and seller are eliminated. The cost of reclamation is 10 c. per carboy. W. H. B. (*C. A.*)

PATENTS

44. Glass composition. W. C. TAYLOR. Can. 227,457, Dec. 26, 1922. A glass contains over 70% SiO_2, over 2% B_2O_3 and a halogen compd. Cf. *Ceram. Abs.*, **2** [3], 64(1923). (*C. A.*)

45. Furnace for molten glass. C. S. STAFFORD. U. S. 1,443,767, Jan. 30. The walls of the furnace are formed of blocks or slabs of refractory material the outer faces of which are treated with waterproofing material, *e. g.*, brass, cement, or enamel, so that cooling liquid can be applied directly to them without damage. (*C. A.*)

46. Continuous cooling furnace for glass vessels. TAMESABURÔ YAMAMOTO. Japan. 40,047, Sept. 20, 1921. (*C. A.*)

47. Glass-melting furnace. SADAJIRÔ KÔNO. Japan. 40,098, 40,099, and 40,100 (additions to 35,150). Sept. 28, 1921. Diagrammatical descriptions. (*C. A.*)

48. Metallic decorations on china or glass. E. WARRIN. U. S. 1,438,799, Dec. 12. A design is printed upon the article to be decorated and the portion of the article not to be decorated is covered with an acid-resisting paste. The article is then immersed in HF soln. and the etched portion is filled with a Ag soln. which is subsequently fused into the material and then successively electroplated with Cu and Au. (*C. A.*)

Heavy Clay Products

49. White glazes for red burning clays. ANON. *Brick Pot. Trade Jour.*, **31**, 32–3(1923).—High opacity is necessary in glazes to cover the red body of the ware. This opacity may be produced with SnO_2. To prevent glazes rich in SnO_2 from peeling or crazing, the clay must contain at least 30% $CaCO_3$. For such clays the glaze must be fully matured at cone 05a (1000°C). Two glazes are available, a raw glaze rich in galena and a fritted glaze which is preferable because it is superior in quality. A raw glaze suitable for this purpose is as follows: Tin ashes 43, galena 32, and flint 25. Good fritted glazes are as follows:

	Frit				
	A	B	C	D	E
Feldspar	32	..	..	..	7
Cryst. Borax	27	..	..	..	..
Boracic Acid	..	..	..	1	..
Whiting	6	..	8	..	..
Red Lead	23	39	31	64	..
Flint	12	36	41	25	33
Tin Oxide	..	9	14	..	..
Potash	..	16	..	..	..
Soda Ash	..	..	6	..	14
China Clay	..	..	..	10	6
Tin Ashes	..	..	..	..	40
	Mill Batch				
Frit	100	..	100	100	..
China Clay	7	..	13	4	..
Whiting	..	..	..	1	..
Red Lead	..	..	..	1	..

Glazes A and D contain no Sn and are therefore less opaque than they might be, yet are suitable for purposes where great whiteness is not required. They are sufficiently fusible to enable one to add 10% SnO_2 if desired. H. G. S.

50. Burning bituminous shale. ANON. *Brit. Clayworker*, **31**, 317–18(1923).—The addn. of sand increases the porosity and greatly facilitates the burning since it aids the combustion of the carbonaceous matter without any serious risk of spoiling the brick. The critical period is between the dullest visible red to a bright red heat. The air supply should be carefully controlled at red heat. If the air supply is too great it will increase the temp. too rapidly vitrifying the surface and thus causing the same trouble that an insufficient supply of air does. The brick should not be fired above red heat until all of them have become oxidized as detd. by draw trials. Brick made of bituminous shale can be fired satisfactorily in a continuous kiln, provided they have a sufficient number of chambers. With great care a 12-chamber continuous kiln can be used, but not economically, and kilns with 18 to 25 chambers are much more suitable. At least 4 chambers should be preheated by waste gas and if this number can be increased to 6 chambers, it is better. Allowing 2 chambers for smoking, 1 being filled, 1 being emptied, and 6 chambers cooling gives a total of 17 chambers, but if the brick are to be thoroughly well burned it will usually be necessary to have 2 chambers at full fire thus making 18 chambers a minimum. Some shales require as many as 10 chambers in the preheating zone. Other shales are so rich in bituminous matter that they can be burned in continuous only when the various chambers in the kiln can be worked independently. H. G. S.

51. Salt glazing brick. ANON. *Brit. Clayworker*, **31**, 356–7(1923).—The brick to be salt glazed may be made (*a*) by hand and allowed to stiffen on a drier floor, (*b*) by the wire cut process and then repressed, (*c*) by the stiff plastic process and (*d*) by the semi-dry process. The brick should be placed in the kilns in a careful and systematic manner in such positions that the faces and ends to be glazed are exposed to the atmos. of the kilns, while all other faces and ends may be "covered" by placing them in close contact with one another. There must be sufficient open space for the salt to have ready access to the bricks or the glazing will be imperfect. Some firms prefer to arrange the bricks in narrow walls or blades about 10 in. wide, while others arrange them in the form of a checkerwork or honeycomb. The salt glazing is accomplished in a manner similar to that used for glazing sewer pipe. The amt. of salt required varies with the clay, but with care 10 to 20 ozs. per cu. ft. of kiln capacity will suffice. H. G. S.

52. Brick roads for Britain. A. E. BROWN. *Brit. Clayworker*, **31**, 346(1923).—The subject was dealt with by Mr. Brown before the Inst. of Clayworkers (London). The transformation in character of road traffic and its increased volume during the last few years has changed the problem of road construction considerably. The change is manifested in reduction of horse-drawn traffic, increase of motors, increase in axle load and speed. The essential properties necessary to stand up against these changes are: (1) durability, (2) foothold, (3) ease of repair, (4) economy of maintenance. Roads carrying large motor traffic are subjected to shock caused by the increased axle load accompanied by increased speed, and also to attrition of its surface due to the physical effects of the pneumatic tires. Asphalt and tar macadam do not stand the strain of this double attack very long, and repair is necessary much sooner than would be credited. B. then explains the advantages of the brick road, referring to many examples in Amer. roadmaking. In durability it comes higher than any other with the exception of the granite set road which however, comes lower in the attrition test. Vitrified brick, hard and dense in quality is the ideal material although others have been used with satisfaction and the only physical test of any value is the standard rattler test used in Amer. but unknown in Eng. In the test the ideal is that the bricks submitted

to it should not lose more than 22 to 24% of weight, but bricks losing as much as 39% have been used satisfactorily. According to all Amer. authorities the brick road is superior to any other and its qualities are: (1) It is impermeable; (2) durable; (3) gives perfect foothold; (4) requires the least tractive force; (5) is suitable for all gradients; (6) and for all classes of traffic; (7) is practically noiseless; (8) is easily cleaned; (9) yields no mud or dust; (10) is easy to repair; (11) is cheapest by far to maintain; (12) can be laid with smaller camber; (13) is not influenced by climate; (14) is easily opened and reinstated when pipes, etc., have to be laid; (15) improves with use. The standard rattler test is explained and also methods of laying; approx. cost of a sq. yd. of brick paving is 8s. 9d. as compared with 6s. 6d. for tar macadam and 10s. 6d. for asphalt carpet. The slightly greater cost is negligible when compared with the shorter life and greater maintenance cost of the latter two. B. concluded with the suggestion that an association be formed to conduct expts. in Eng. and a discussion followed by the members of the Inst. O. P. R. O.

53. Glazing bricks. ANON. *Raw Materials Rev.*, **2**, 109(1923).—Under a Ger. specification, a coating-compn. to be applied to concrete, sandstone, clay, brickwork, or the like, consists of water and finely sifted cement, with a water-proofing ingredient, such as a bituminous, resinous, or wax-like substance or a metallic soap. Suitable soaps are obtained by using a mixt. of alk. soap with ammoniacal zinc soln. or ammoniacal or alk. soln. of copper, lead, tin, chromium, or aluminium hydroxides, or a mixt. of calcium suboleate and aluminium sulphate. O. P. R. O.

54. New brick plant. ANON. *Brick and Clay Record*, **62**, 509–13, 516–17(1923).—Diagram and photos of new brick plant of Gloninger and Co., Vanport, Pa. Plant produces waterproof brick. Description of unique efficiency layout, incorporating automatic clay crushing and grinding; vibrationless brick machine unit; handling of drier cars without switch, turntable or transmission; signal system in drier and remarkable storeroom. J. W. H.

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55. Clay flux for brick compositions. B. SCHMIDT. U. S. 1,442,585, Jan. 16. A flux for use with clay in brick manuf. is formed from pulverized glass, salt, pulverized granite and oxidized Zn. (*C. A.*)

56. Clay pavement. H. L. HADLEY. U. S. 1,441,342, Jan. 9. The surface of a formed clay pavement is fired to harden it. (*C. A.*)

Refractories

57. Quartz (Norway). OLAF ANDERSEN. *Norges Geologiske Undersokelse.*, **103**(1922).—Quartz, comparatively pure, occurs in S. Norway, the quantity available by quarrying from surface now exposed is estd. at from 4 to 500,000 T. Analyses are given. Assays show that two out of 7 samples contained insignificant amts. of gold and silver. O. P. R. O.

58. Bauxite: Occurrence, mining and uses. RAYMOND B. LADOO. *Eng. Mining Jour.*, **114**, 805–9(1922).—Arkansas produced (1920) over 90% of U. S. bauxite or about 60% of the world output for that year. Manufacture of abrasives and refractories consumes from 10% to 20% of domestic product. Bauxite (high grade) melts at 1820°C, Al_2O_3 at 2050°C. Bauxite brick are chem. inert at high temp. Alundum, adamite, alowalt, aloxite, metalite, rex, oxalumina, are some of the trade names of more or less pure Al_2O_3 produced from bauxite. La Farge cement, fused cement, "cement fondu" are names for high alumina (40%) quick setting and hardening cements. S. L. G.

59. The marketing of chromite. EDWARD SAMPSON. *Eng. Mining Jour.*, **115**, 356–8(1922).—Chromite is the only ore of chromium and its compds. Theoretically,

Cr_2O_3 68%, FeO 32%; Al_2O_3 and Fe_2O_3 may partly replace Cr_2O_3 and MgO and FeO. Little or no chromite is normally produced in U. S. New Caledonia, Rhodesia, India, main producers, Turkey in Asia, Russia and Greece less important. Refractories consumed 35% of chromite brought into U. S. in 1922. Chemicals 25% and ferro chrome 40%. Chromite for refractories should be low in silica. Analyses of representative ores given. Marketing, prices, production and imports charted 1909–1922. S. L. G.

60. The durability of refractories. W. J. Rees. *Pottery Gaz.*, **48,** 453–8(1923).—A general paper on refractories, a considerable portion of which advocated the use of silica brick for construction of the by-product coke oven. A discussion followed the paper. J. W. H.

61. Glass house refractories. Anon. *Pottery Gaz.*, **47,** 727, 729, 731, 733, 735 (1922).—A lengthy discussion of failures in refrac. materials for glass house use. J. W. H.

62. Dolomite (Norway). Olaf Holtedahl and Olaf Andersen. *Norges Geol. Undersokelse.*, **102**(1922).—Dolomite, pure and fine grained, occurs in N. Norway. Preliminary expts. on burning dolomite are described. Small charges of dolomite were heated elec. to observe the degree of sintering attained and the dusting due to impurities of silicates or quartz in the dolomite. Each example was examd. under the microscope before and after the ht. treatment: htg. for 2–5 hrs. at about 1400°C did not produce any effective sintering of the varieties of pure dolomite. Dusting had no harmful effect in the samples examd. Structure and size of grain of the raw dolomite had no predominating influence on the corresponding properties of the burned product. The mixt. of lime and magnesia forming the results of the burning were always very fine grained. A brief review is given of the more promising methods for utilization of dolomite as an industrial raw material. Among the methods mentioned is elec. sintering and melting of dolomite exptd. on by a Norwegian firm, Ostlandske Stenexport Co. References are given to U. S. Bur. of Mines pubs. It is briefly indicated which methods might be used in attempting the exploitation of dolomite in Norway, the most recommendable way seems to be to try one of the methods suggested for the sepn. of lime from dolomite possible in connection with elec. sintering or melting of raw dolomite. O. P. R. O.

63. Durability of refractories. W. J. Rees. *Colliery Guardian*, **125,** 515.—R. brings out the foll. points: The importance of refrac. materials in present-day civilization is now accepted. Much less than a generation ago it could be said that the tech. study of the use of refrac. in this country was on a much lower plane than in Ger., but during the last 10 yrs. the leeway has been made up. Refrac. is now a final subject for degrees at the Univ. of Sheffield and manufacturers are stressing the need for research. The life of a fur. or fur. lining should not be measured in days, wks., or mos., or even in heats; the factor to ascertain, and the only sound basis on which to make comparisons, is the cost of refractories per T. (or other unit) of salable product. "Failure" might be loosely defined in terms of a life much shorter than the average, or in terms of a much higher cost in refractories per unit of satisfactory product. An analysis of "failures" which had come under the author's notice enabled the placing of them into four classes: (*a*) Unsatisfactory quality, including lack of uniformity of quality. (*b*) Faulty selection owing to the absence of knowledge of the conditions to be met. (*c*) Faulty treatment of the material in service, due either to accident, carelessness, or ignorance. (*d*) Failure to allow a margin so that abnormal conditions of short duration may be withstood, *i. e.*, "factor of safety." Failures of the first 2 classes should be entirely eliminated, and of the third, could be also to a marked extent, by educ. of charge hands. The standard methods of testing proposed by the refractories section of the Ceram. Soc. are well

known and widely used but the provisions of other tests which give measurable results and the amplification of some of the existing tests is desirable. The available methods to det. the resistance of refrac. to abrasion and slag attack are as yet purely comparative. It can be roughly detd. by drilling a hole in the brick, filling it with the slag or ash and heating under pre-detd. conditions. The brick is then cut or broken across the hole and the extent of corrosion or depth of penetration observed. A better method is to cement to the face of the brick a clay ring and fill this with the slag or ash as the face or skin of the brick is not then removed and its lower porosity may retard the speed of corrosion. Results of comparative tests of several brick are then given in detail. When the brick are being used for the building of coke ovens, if the coals, which are being coked are non-salty, satisfactory durability is obtained from either fire clay or semi-silica brick, but there is definite evidence from Amer. practice, that a silica brick oven construction renders possible the use of higher coking temps. and a larger output from an oven of given size without any sacrifice of by-products. Even the highest grade of fire clay brick will deform under load at a temp. well below its normal softening point, while a highly converted silica brick of low porosity will carry load almost up to its fusion point. At high coking temps. therefore the durability of adequately made silica brick will exceed that of brick made wholly, or in part, of fire clay. O. P. R. O.

64. Molding sands. W. J. REES. *Metal Indus.*, **22,** 197(1923).—The principal points considered in the investigation of molding sands to make possible specifications or standards so that systematic definite lab. tests would det. the suitability of sands for various classes of work were: The chem. and mineralogical compn.; the texture or mech. compn.; the bonding power or strength; the permeability and porosity; the refractoriness; the durability. The ultimate analysis of a sample of the sand was the first consideration, the ordinary methods of silicate analysis should be used (Standard Methods of Testing, *Trans. Ceram. Soc.*, **1919**). A sample of sand was ground to an impalpable powder in an agate mortar, and then one g. was weighed into a platinum basin; 15 to 20 cc. of hydrofluoric acid and 3 cc. of strong sulphuric acid were added and the mixt. gently stirred with a platinum wire. Gentle evapn. to dryness on a sand bath till all evoln. of fumes had ceased then eliminated the whole of the free and combined silica as silicon fluoride, leaving all the bases as sulphates. This residue of sulphates was weighed, and approx. $^1/_3$ of this wt. represented the wt. of basic oxides present in the sand. The limits in chem. compn. would depend on the purpose for which the sand was intended. Many of the properties of a molding sand depended more on its mineralogical compn. than on its ultimate analysis. The water holding capacity was dependent on the propn. of colloidal matter present. A distinguishing feature of molding sands was their capacity for holding water without becoming really wet. The texture or mech. compn. or grading of the sand was detd. by sieving and elutriation methods. In the sand grade, the silt grade and the clay grade, it was in the clay grade that the bonding power was concd. The coarser grades were pure quartzose sand, while the other minerals were all concd. in the finer grades, the finest or clay grade having the compn. of a ferruginous clay. PROF. BOSWELL'S method for detg. the transverse test and his method for measuring the permeability is also given; variations of from 50 to 500 sec. were obtained in this test, depending on the grading of the sand and the propn. of clay or other fine bond present. The ingenious method of measuring permeability devised at the Canadian Mines Branch is described, which eliminates some of the possibilities of error of the air method. The refractoriness of the sand might be detd. by the ordinary standard method, in which a small cone of sand was heated in an ordinary atm. along with standard cones. The durability of a sand was an impt. factor in its economic use, this could be tested under actual working conditions. Synthetic molding sands used in Gr. Brit. and Amer. were discussed. Rees believed that it would

be possible to make a synthetic sand which would give results in the steel foundry quite equal to those obtained with imported molding sands. Synthetic molding sand was prepd. from a high silica sand with the addn. of some material which would give it the necessary bond. The subject needed further investigation to perfect the synthetic sand, which when accomplished would make standardization possible, and variations practically eliminated. The question of the use of synthetic sand and the possibility of the use in them not only of clay, but also of starch, flour, and many of the carbohydrates required extended study. Rees mentioned the addn. of an exceedingly small propn. of alkali to the clay which had the effect of deflocculating it. Crushing the quartz grains should be avoided, and he thought that this deflocculating action pointed the way to a method of adequately mixing sands and clays. O. P. R. O.

65. Slag action on refractory linings. H. Hirsch. *Tonind. Ztg.*, **47**, 152–4(1923).—The influence of 9 different slags on different refrac. were studied. It was found that the porosity of the brick is more impt. than the Al_2O_3 content and the softening point. Brick made of fused clay (containing 70% Al_2O_3) were practically unaffected by slag action. Refractoriness is not important as long as the brick withstands the temp. at which they are used. Brick to resist slag should have a softening point above cone 28, compress. strength above 80 kg./cm.^{2}, the shrink. upon reheating to cone 14 should be less than 2% and should be dense and non-porous. H. G. S.

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66. Refractory material for furnaces. C. A. Scharschu. U. S. 1,444,527, Feb. 6. A refractory compn. is formed in part of a coherent mixt. of crystd. MgO, calcined MgO of lower d. and C and in part of a subvitreous monolithic layer of MgO particles bound together by sublimed MgO. This layer has a mass d. of 3.5–3.6 and is so hard that it has a metallic ring even at elec. furnace temps. and it undergoes no material expansion or contraction at temps. up to 1800°. (*C. A.*)

67. Bonding carbide grains with ceramic material. M. F. Beecher and M. C. Booze. U. S. 1,444,162, Feb. 6. Grains of Si carbide or similar material are mixed with a ceramic binder such as a plastic clay compn. and the mixt. is fired in the presence of reducing gases or other medium which will prevent oxidation. (*C. A.*)

68. Electric furnaces. W. E. Moore. Can. 226,309, Nov. 21, 1922. In the manuf. of steel or other metals in an elec. furnace current is supplied to the bath from a plurality of arcing electrodes and the amt. of current passing through the bath is varied by varying the length of one or more of the arcs with respect to the others. The melt may be produced by means of a high voltage and long arc and refined with substantially the same current with reduced voltage and shorter arc. (*C. A.*)

69. Electric furnaces. W. E. Moore. Can. 226,310, Nov. 21, 1922. In the treatment of steel or other metals in an elec. furnace supplied with power from a multiphase circuit, a circulation of the bath is produced by a rectified current from the current of sep. phases. Two or more currents of different phases may pass from the electrodes to the bath and the amt. of current passing through the bath may be varied by unbalancing the resistance of the arcing circuits. (*C. A.*)

70. Electric metallurgical furnaces. W. E. Moore. Can. 226,311, Nov. 21, 1922. The furnace has a chamber adapted to contain metal, an elec. arc in the upper part of the chamber for heating the metal, a pair of extensions on the furnace bottom angularly disposed with respect to each other and to the central axis of the furnace. Each extension has a channel in the form of a loop of elongated transverse section which gradually expands upwardly into communication with the main chamber and an elec. heating element around which each extension is looped. (*C. A.*)

71. Electric furnace. F. T. Snyder. Can. 226,318, Nov. 21, 1922. A furnace

having refractory heat insulating walls and an arc resistor with a negative temp. coeff. is started with a long arc at high voltage and small current and the heat is furnished with a short arc at low voltage and high current. (*C. A.*)

72. Electric furnaces. I. RENNERFELT. Can. 226,027, Nov. 14, 1922. The furnace has a plurality of electrodes suspended into a projection from the bottom of the furnace under the electrodes, a conducting layer of C on the projection forming contacts for the ores formed, and a channel along the heating zone of the arcs for receiving the material to be heated. (*C. A.*)

73. Electric reverberatory furnace adapted for smelting ores. R. M. KEENEY. U. S. 1,438,381, Dec. 12. (*C. A.*)

74. Induction furnaces. J. R. WYATT. Can. 226,811, Dec. 5, 1922. The furnace has a pool for molten metal, walls forming a closed channel below the pool, the channel communicating with the pool at two points and having parts of the channel forming an acute angle at a distance from the pool and a transformer for which the metal in the channel acts as secondary, setting up motor effect in the channel. Cf. *Ceram. Abs.*, **1** [11], 279(1923). (*C. A.*)

75. Refractory ceramic ware. J. A. JEFFERY. U. S. 1,438,599, Dec. 12. A refractory material adapted for furnace linings or saggers is formed from a raw batch comprising a granular refractory material such as Si carbide and Edgar's plastic kaolin or a clay of like character. (*C. A.*)

76. Bonded alumina refractory material. M. F. BEECHER. U. S. 1,439,286, Dec. 19. Cryst. Al_2O_3 grains contg. slag and oxidation impurities are integrally united by a vitrified ball clay material so that the grains are substantially in contact and shrinkage of the article during firing is minimized. Articles such as fire bricks may be thus formed and are fired above cone 12 until any permanent vol. change due to expansion of the material has been completed. (*C. A.*)

77. Refractory materials. E. D. FROHMAN. Brit. 186,968, June 10, 1921. A refractory compn. consists of finely divided fire clay, a siliceous refractory substance such as ganister or asbestos, and a vegetable substance which acquires binding properties when moistened with H_2O, such as sulfite pitch (a by-product from the manuf. of sulfide pulp), dextrin, or gum arabic. The compn. is mixed with H_2O when required for use. (*C. A.*)

78. Tilting oil-fired crucible furnace adapted for melting metals. J. A. GASKILL. U. S. 1,439,409, Dec. 19. (*C. A.*)

79. Material for furnace walls. J. H. GRAY. U. S. 1,439,410, Dec. 19. Bricks for furnace walls are formed mainly of a carbonaceous material such as calcined anthracite mixt. with a facing layer of another refractory material more resistant to oxidation, *e. g.*, MgO, clay and SiO_2, Cr ore or zirconia. (*C. A.*)

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80. Refractory materials. Z. OLSSON. U. S. 1,442,413, Jan. 16. A refractory material adapted for crucibles or furnace linings is prepd. from bauxite 95 and bentonite 5%. (*C. A.*)

81. Refractory articles containing zircon. H. H. BUCKMAN and G. A. PRITCHARD. U. S. 1,440,766, Jan. 2. Muffles, crucibles or similar refractory articles are formed of zircon and carborundum. (*C. A.*)

82. Refractory articles containing zircon. H. H. BUCKMAN and G. A. PRITCHARD. U. S. 1,440,657, Jan. 2. Retorts, muffles or other refractory articles are formed of zircon and SiO_2 or clay. Cf. *Ceram. Abs.*, **1** [3], 68(1922). (*C. A.*)

83. Refractory material for high-temperature apparatus. H. B. CLAPP. U. S. 1,437,584, Dec. 5. A mixt. of chromite 85 and ferro-Si 5 parts reduced to small particles

and associated with a binder, *e. g.*, Na silicate soln. 10 parts, is used for making linings of portable *gas producers* or other articles exposed to high temps. (*C. A.*)

Whiteware

84. The crazing of English earthenware. H. Elwood. *Pottery Gaz.*, **48,** 104–6 (1923).—The author considers bulk of crazing of earthenware bodies due entirely to variations in *body* compn. 80 bodies were made and dipped in a standard glaze. All bodies were glost fired at cone 01, and the biscuit firing was varied as follows: cones 04, 01, 2–3, 3–4, and 8–9. For this work the glaze used had the compn.:

$$\left.\begin{matrix}0.070\ K_2O\\0.233\ Na_2O\\0.400\ CaO\\0.290\ PbO\end{matrix}\right\}\quad 0.251\ Al_2O_3\quad\left\{\begin{matrix}3.164\ SiO_2\\0.402\ B_2O_3\end{matrix}\right.$$

The author concluded the best compn. for a safe body for practical working was 75.24 SiO_2; 20.59 Al_2O_3; in the fired condition, 4.18 bases. Before firing the composition was 71.10 SiO_2; 19.50 Al_2O_3; 3.97 bases 5.42 loss on ignition. Body was safe in firing range from cone 01 to cone 9, and porosity varying from 27.63 to 2.25%. It met with requirements of practical potting, as regards plasticity and safety during firing up to, say, cone 6, which was the limit required in hardest earthenware fire. The recipe for body is 40 clay; 50 flint; and 10 feldspar. Using a normal variety of flint and a mixed Cornish stone in place of the feldspar the batch is thus: 26 ball clay; 22 china clay; 19 stone; and 33 flint. However, the author pointed out that alteration of compn. of only one material in the mixt. may cause trouble. This was demonstrated by making up an earthenware body of definite compn., but using 64 different varieties of china clay. Fired at ordinary earthenware biscuit and glost temp. he obtained both crazing and peeling. J. W. H.

85. The atmospheric conditions in potters' shops and the efficiency of various types of drying stoves. H. M. Vernon. *Pottery Gaz.*, **47,** 1825–7(1922).—Av. temp. of potters' shops is about 67–70°F in winter and 75–82°F in summer as compared with usual workshop which is maintained at 60–65°F in winter. However, relative humidity, because of drying moist clay, is not high for the reason that the high temp. permits carrying more moisture without becoming half saturated. Author concludes, from evidence obtained, that potters are correct in maintaining high temps. are requisite for drying moderately sized articles and molds. It is obvious, however, a certain amt. of ventilation is necessary. The drying stoves investigated had enough leakages to insure fair ventilation. Attempts should be made to convey heated air to atm. but such installations require an independent heating system in the shop. J. W. H.

86. Chemical porcelain. G. White. *Pottery Gaz.*, **47,** 566–7(1922).—Hypothesis regarding the fracturing of chem. porcelain is given. Chem. porcelain being a supercooled liquid; the author advances the theory that fracturing is result of devitrification or an attempt at crystn. under *stress*. The requirements for production of chem. porcelain (1) body mixt. should be of such nature to be capable of as complete devitrification as possible, (2) adequate process of devitrification should be applied. In Worcester mixes max. crystn. occurred in a burning of 84 hrs. of which 30 hrs. consisted in heating from 1300 to 1400°C. In this period max. production of sillimanite occurred, advancing devitrification to a limit at which liability to further crystn. was sufficiently removed to make a high grade chem. porcelain. A method for measuring degree of crystallinity and ht. change resistance is needed badly to attack the problem adequately. J. W. H.

87. Pyrometers as applied to pottery industry. C. E. Foster. *Pottery Gaz.*, **48,** 441, 443, 445–6(1923).—A lengthy and general address bearing upon diff. types

of pyrometers, development of thermo-elec. pyrometer, base and noble metal thermocouples, functions of the protection tube or sheath, location of thermocouples and Seger cones. J. W. H.

88. Porcelain manufacture in Indo-China. ANON. *Brit. Clayworker*, **31**, 371.—The beginning of national porcelain industry at Tonkin is announced. It is due to the initiative of an Annamite who recently studied the industry in France and now employs at the Hap Loy works some 350 men. Indo-China itself promises to be the principal sales outlet. The local Gov't is supporting the venture by giving the firm an order for electric insulators required by the Post Office. Molds for the manuf. of European table and toilet services are on their way out, and the owner intends to adopt Japanese and Chinese styles for wares intended for the Annamite population. O. P. R. O.

89. Scientific aspects of China's ancient pottery industry. G. WANG. *Science* (China), **6**, 869–82(1921).—The manuf. of glazed ware in China dates from about the year 100 B. C. The excellence of the early pottery ware was due to the use by the Chinese of a feldspar glaze and high temps. Cu, Fe and Pb colors were largely used. There is no evidence of the use of Cr or U compounds. A type of furnace built on the principle of the Hoffman Ring furnace has been in use for at least 1000 years.

W. H. A. (*C. A.*)

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90. Fused ceramic bearing. T. G. MCDOUGAL and S. J. MCDOWELL. U. S. 1,438,188, Dec. 12. Annular bearings for speedometers or other instruments are formed of a fused ceramic material prepd. from a mixt. of feldspar and clay. (*C. A.*)

91. Crucible of chemical porcelain. H. D. LILLIBRIDGE. U. S. 1,441,690, Jan. 9. The pat. relates to the curvature of the wall of the crucible, which flares outwardly at its top. (*C. A.*)

92. Ceramic electric insulating material. J. A. JEFFERY. U. S. 1,438,598, Dec. 12. Cf. *Ceram. Abs.*, **1** [8], 211(1922). Ceramic insulating material is formed from a raw batch composed of a calcined mixt. of clay, alumina and talc or feldspar mixed with raw clay. The clay of the calcine is selected so that it matures at the temp. of the formation of sillimanite and the raw clay is of such a nature that when heated by itself it matures at the temp. at which the ceramic mixt. matures. (*C. A.*)

93. Electrically heated ceramic ware. A. STEINHARDT. Brit. 188,050, July 28, 1921. In the construction of an electrically heated ceramic vessel, the vessel after being fired is fitted with a heating resistance provided with terminals, the heating body being then covered with ceramic material having the same coeff. of expansion as the resistance and composed of the same materials as the vessel but with the addn. of fluxing materials which lower its sintering temp. below that of the heating resistance, after which the entire app. is again fired. The vessel is essentially made from kaolin, feldspar and quartz and the fluxes added to form the material may consist of the oxides of Mg, Na, Pb and B together with a little Na chloride and waterglass. For a vessel composed of clay 48, quartz 40, feldspar 12%, and provided with a heating body of nichrome the material may have the following compn. by wt.: Na_2O 0.1, K_2O 0.3, MgO 0.4, CaO 0.2, Al_2O_3 0.4, SiO_2 2.6 parts, and 4 parts of the material used in making the vessel. Such a compn. may be obtained by using borax 120, MgO 50, chalk 40, sand 70, Na_2CO_3 20, feldspar 100, PbO 40, zettlitz kaolin 100, fluorspar 60, Na_2SiO_3 50 parts, and 150 parts of glaze appropriate to the porcelain mixt. The terminals are in a holder and are preferably arranged side by side at 90° to the handle. In a modification the vessel has a raised bottom with a spiral groove on the underside in which the heating wire is situated. (*C. A.*)

94. "Safety-tread" ceramic tile. G. N. JEPPSON and M. F. BEECHER. U. S. 1,445,083, Feb. 13. Vitrified tiles of ceramic material are formed with cryst. granules

of Al_2O_3 or other abrasive material integrally embedded within the superficial or tread portion of the tile. (*C. A.*)

Equipment and Apparatus

95. The "Dorr" mill. A. S. W. Odelberg. *Pottery Gaz.*, **47**, 1671, 1673, 1675 (1922).—Description of a continuous grinding system at Gustafsberg for grinding a mixt. of equal parts of calcined quartz and flint. Capacity at present operation 7.2 T. per 24 hrs. or 11 lb. per min. dry wt. Thickness of pulp is 1.6 sp. gr. or 32 oz. per pint. Pebbles were worn away at the rate of 300 lb. per 24 hrs. Mill run at 35 r. p. m. Output of one unit of continuous system is equal to 5 times the output per unit compared with batch grinding. J. W. H.

96. A new viscosimeter for very viscous substances. R. Fischer. *Seife*, **45**, 483–4(1922); *Chimie et industrie*, **9**, 89(1923).—A jacket in which water circulates at 62° surrounds a tube contg. the sample, the temp. of which remains const. at 58°. The time required for an Al ball to fall the length of the tube is noted with a stop watch. Pure glycerol is taken as standard, and the viscosity is expressed as the ratio of the time of fall with the sample to that with glycerol. With dark or opaque liquids the Al ball is made to close an elec. circuit and light a lamp. A. P.-C. (*C. A.*)

97. Elastic column dynamometer for hardness testing. H. A. Holz. *Chem. Met. Eng.*, **28**, 269–70(1923). Illus. E. J. C. (*C. A.*)

98. Some notes on the evolution of the konimeter. R. A. H. Flugge-de Smidt. *J. Chem. Met. Mining Soc. S. Africa*, **23**, 77–86(1922). E. J. C. (*C. A.*)

99. New calculation for the determination of the strength of flanges. Oswald Klinck. *Chem. App.*, **10**, 3–4(1923).—Mathematical formulas. J. H. M. (*C. A.*)

100. Personal equation errors in optical pyrometry. Georg Keinath. *Stahl u. Eisen*, **43**, 9–12(1923).—Comparable temp. measurements by unskilled operators using the total, and the partial radiation, and disappearing filament optical pyrometers from 600° to 1500° show the disappearing filament optical pyrometer to be most serviceable. Facilities in operation permit a rapid proficiency and an accuracy of ±20° from 600–700°, ±15° at 100° and ±10° at 1500°. Above 1500° the radiation pyrometer is used. W. A. M. (*C. A.*)

PATENTS

101. Tubular resistance electric furnace. G. M. Little. U. S. 1,443,581, Jan. 30. A furnace adapted for baking green resistance rods is formed of tube sections (of graphite or other resistance material) held together end to end under pressure and surrounded by heat-retaining material, *e. g.*, lampblack and asbestos. (*C. A.*)

102. Electric resistance crucible furnace. C. H. Carpenter. U. S. 1,444,948, Feb. 13. Cf. *Ceram. Abs.*, **1** [9], 234(1922). (*C. A.*)

103. Tilting electric arc crucible furnace for smelting silver ore. R. M. Keeney. U. S. 1,443,024, Jan. 23. (*C. A.*)

104. Tilting electric furnace adapted for melting scrap iron. D. DeLuca. U. S. 1,442,925, Jan. 20. (*C. A.*)

105. Electric inductive furnace. G. H. Clamer and J. R. Wyatt. U. S. 1,444,584, Feb. 6. The furnace has a resistor dome and is adapted for melting metals. (*C. A.*)

106. Electric arc furnace. F. A. J. FitzGerald. U. S. 1,443,816, Jan. 20. The pat. relates to the manner of mounting opposed horizontal electrodes which are adjustable and extend through the side walls of the furnace. The furnace is adapted for use on single-phase current. Cf. *C. A.*, **17**, 371. (*C. A.*)

107. Electric arc furnace of the rocking type. W. E. Moore, H. F. Alter, E. A.

HANTF, J. R. ECKLEY and F. WRIGHT. U. S. 1,444,980, Feb. 13. The furnace is adapted for melting steel. (*C. A.*)

108. Rotating or oscillating electric furnace plants. A. H. PEERSON. Can. 228,203, Jan. 23, 1923. (*C. A.*)

109. Electric furnace. R. A. DRISCOLL. Can. 228,167, Jan. 23, 1923. An elec. furnace has a rotatably mounted inclined tube connected with an outlet in the furnace roof, means for rotating the tube, means for introducing charge materials into the upper end of the tube and auxiliary means for feeding material into the furnace. (*C. A.*)

110. Electric furnaces. F. W. SPERR and H. J. ROSE. Can. 227,463, Dec. 26, 1922. An elec. furnace for testing materials consists of a row of heating units forming a long narrow chamber to receive a testing tube and means for connecting the units in circuit progressively from one end to the other so as progressively to heat the sample of material being tested. The units are U-shaped, of refractory material wound with resistance wire. (*C. A.*)

111. Electric resistance furnaces. T. A. REID. U. S. 1,444,939–40, Feb. 13. (*C. A.*)

112. Electric resistance furnace. T. A. REID. U. S. 1,443,590, Jan. 30. Heating units within refractory walls include plates which are brought into operative position by a lateral and tilting movement. (*C. A.*)

113. Electric resistance furnace. G. M. LITTLE. U. S. 1,443,580, Jan. 30. The pat. relates to the manner of mounting and cooling the electrodes. The furnace is adapted for heating metals. Cf. *Ceram. Abs.*, **1** [6], 163(1922). (*C. A.*)

114. Apparatus for testing abrasives. L. RATNER and M. SCHWARZ. U. S. 1,444,803, Feb. 13. (*C. A.*)

115. Scleroscope. G. WIRRER and A. C. MOYER. U. S. 1,444,228, Feb. 6. The app. comprises a hammer moving in an open-ended tube with a cylinder and manually operated piston mounted on its upper end for actuating release mechanism for the hammer. (*C. A.*)

116. Scleroscope. R. HERRMANN. U. S. 1,444,606, Feb. 6. The device comprises a gravity-actuated hammer mounted with a driver device to return the hammer to its starting position. U. S. 1,444,607 relates to a similar app. adapted for testing the hardness of metals. (*C. A.*)

117. Apparatus for analyzing flue gases. R. F. MACMICHAEL. U. S. 1,443,492, Jan. 30. Flue gas and air are drawn by sep. suction fans through humidifying and temp.-controlling app. and the amt. of CO_2 in the flue gas is indicated by a recording drift gage depending on the differential pressures of the gas and air. (*C. A.*)

118. Apparatus for drying materials by steam and air currents. H. BENTZ. U. S. 1,436,142, Nov. 21. (*C. A.*)

119. Pyrometer of the potentiometer type. H. J. BLAKESLEE. U. S. 1,441,207, Jan. 9. (*C. A.*)

120. Ball testing apparatus for estimation of resiliency of metals, rubber or other materials. R. M. GASTON. U. S. 1,441,626, Jan. 9. A steel ball is held by a magnet and released from a definite height and allowed to fall upon the material under test and the rebound of the ball is noted. (*C. A.*)

Kilns, Furnaces, Fuels and Combustion

121. John Wright tunnel oven. ANON. *Pottery Gaz.*, **47**, 1538(1922).—Installation at British Pottery Co., Tunstall. Built on the car tunnel kiln principles; that is, stationary fires and moving ware. Kiln is over 200 ft. long, internal width is about 5 ft. and height from truck platform to crown of arch about 6 ft. Capacity of each truck,

about 50 saggers. Charging schedule is one car per hr. An elec. motor penetrates charging ram, the actual charging time is 1 min. Firing zone operates at 1200°C. Gas is supplied by a Horsehay producer and arrangements made for burning off tarry matter which may be deposited in the flues. Primary air is heated in brickwork, and secondary air is drawn through cooling zone. This air cools the ware in the saggers and in consequence is heated. Waste ht. is used for drying purposes in manuf. process. An inspection pit runs the entire length of tunnel under the trucks. Coal consumption is about 300 lb. per hr. Photographs accompany article. J. W. H.

122. The "Potter" kiln. ANON. *Pottery Gaz.*, **47,** 1535(1922).—Description and phot. of gas fired continuous kiln erected by Dean, Hetherington & Co. at Alexandra Works of Domestic Porcelain Co., Fenton. Kiln consists of 16 chambers in a double row of 8 with a gangway between. Kiln is fired with a No. 4*a* Duff producer, with gas and air ports in central opening between the 2 rows of chambers. This opening is fitted with shelves to dry saggers from the green state by means of waste ht. from various chambers as they are fired. All chambers are connected to a stack 135 ft. high. Gas and air ports are underground. Saving of fuel claimed as 50% and labor as 25%. Quality of fired ware up to standard. Highest sagger is not more than 12 ft. above level of chamber. J. W. H.

123. Electric resistance furnaces. C. R. DARLING. *Electrician*, **90,** 168(1923).—Advantages of elec. heating *vs.* gas heating are enumerated. Ni-Cr alloys, in the shape of wire and ribbon, are widely used. They can be operated at 1000° for long periods of time without deterioration. For high speed steel treatment a resistor alloy that will operate at 1300° to 1400° is needed. D. believes that "a cheap alloy capable of withstanding 1800° without oxidizing" could be made. C. G. F. (*C. A.*)

PATENTS

124. Muffle furnace. A. McD. DUCKHAM. U. S. 1,436,582, Nov. 21. An annular muffle furnace is built with a traveling platform to which material may be supplied and from which the residue of the material may be removed without interrupting the operation of the furnace. (*C. A.*)

125. Rotary horizontal furnace or kiln adapted for heating granular or pulverulent material. A. DWORZAK. U. S. 1,443,529, Jan. 30. The kiln is surrounded by concentric chambers for hot gases and cooling water. (*C. A.*)

Geology

126. Feldspar. ANON. *Can. Min. Jour.*, **44,** 237(1923).—Potash feldspar (orthoclase and microcline) which occurs in abundance in several parts of Canada, contains in its pure state 18.4% alumina and 16.9% potash, with a combined potential value slightly below that of the same constituents in alunite. Should an economical process for resolving potash feldspar into its constituent parts be found, the comparative accessibility of Canadian feldspar deposits will put them in position for manuf. Large deposits of anorthite (lime feldspar) which contain in the pure state 36.7% alumina, the remainder being silica and lime, are also available in Canada. It is possible that some simple process may be found whereby this alumina may be made commercially available. O. P. R. O.

127. Note on the formation of the Alsatian potash basin. RAOUL LEBRUN. *Bull. Soc. ind. Mulhouse,* **88,** 508–11(1922).—The basin consists essentially of 2 potash layers which are worked and between which are: an unworked deposit of high-grade K salt 0.80 m. thick, a layer of almost pure K salt 0.30 m. thick and 1.80 m. above the first and lying between 2 layers of shale, layers of shale and salt of varying thicknesses, a 10-m. layer of rock salt just below the upper of the two worked deposits, and above and

below the potash layers are alternating layers of rock salt and of shale. From a detailed examn. of the fissures in the shales, L. concludes that the K deposits were not formed in a continuous manner but are the result of the leaching of considerable dry marine deposits, the waters having flowed to what is now the Alsatian basin, where they were evapd. A. P.-C. (*C. A.*)

128. Report of the work of the ceramic division. JOSEPH KEELE. Can. Dept. Mines, *Summary Report*, No. **574,** 55–71(1922).—The Canadian deposits of brick, fire, pottery and special clays are described. L. W. R. (*C. A.*)

Chemistry and Physics

129. Action of heat on kaolins, clays. ANON. *Jour. Soc. Chem. Indus.*, **42,** 184A.—Samples of kaolins, clays, bauxites, infusorial silicates, etc., have been submitted to heating under varying conditions over a wide temp. range. The results show that plastic ceram. materials under the action of heat, undergo first a hardening without dehydration or change in vol.; this hardening is due to the partial peptising of the colloids which they contain. After dehydration and above 700°C phys. changes occur accompanied by shrinking, and the substances continue to harden, and at the same time the colloids disappear. Non-plastic ceramic materials only harden once, at about 1000°C, after their complete dehydration has occurred at 650–700°C. The phenomenon of peptisation of colloids plays a considerable part in the ceram. indus. and particularly in the industries based on baked earths. (*Comptes rend.*, **176,** 91–3(1923).)
O. P. R. O.

130. Coal. A. C. FIELDNER, *et al.* *Proc. Am. Soc. Testing Materials*, **22,** I, 459–62(1922).—Report of Comm. D-5. The micropyrometer method for coal ash fusibility (*C. A.*, **16,** 3381) was compared with the standard gas-furnace method (*C. A.*, **14,** 1028). The 2 methods checked fairly well on most coal ash fusing below 2600°F by the gas furnace method, but very refractory ash, fusing above 2600°F by the same method, gave much lower results by the micropyrometer method. Tentative revision was made of standard methods of lab. sampling and analysis of coal (D22-21), and of the tentative method of test for fusibility of coal ash (D22-19T). J. L. W. (*C. A.*)

131. The density of a mixture of oxygen, carbon monoxide and carbon dioxide. Relations between the volume per cent and weight per cent. PAUL SCHREIBER. *Z. angew. Chem.*, **35,** 701–2(1922).—Calcns. are made from the laws of dil. gases. The results are plotted in graphical form, convenient for fuel engineers. H. C. P. (*C. A.*)

132. Technical electroösmosis. P. H. PRAUSNITZ. *Kolloid-Z.*, **31,** 319–23 (1922).—Electroösmosis has been industrially used in the purification and partial dehydration of clays, peat, etc. Glue, gelatin, glycerol, nitrocellulose, beet sugar solns., serums and tanning solns. have been purified. The methods for *clay* purification are given in some detail. Clay in colloidal suspension may be pptd. in dense form by d. c. Emulsions may be broken down. Cf. *Ceram. Abs.*, **1** [8], 198(1922).
J. O. H. (*C. A.*)

PATENTS

133. Isolation of alumina from clay. HIROSHI TANAKA and the TOKYO KÔGYÔ SHIKENJO. Japan. 40,177, Oct. 3, 1921. Powdered clay is burned to a porous mass, mixed with concd. H_2SO_3 at low temp. and the mixt. is heated in a Pb-lined autoclave with agitation. When the reaction is completed the mixt. is cooled and filtered in the absence of air. The filtrate is heated at 100° in the absence of air to decompose $Al_2(SO_3)_3$ into Al_2O_3 and SO_2. A product of high purity is obtained. (*C. A.*)

134. Treatment of clay. W. FELDENHEIMER and W. W. PLOWMAN. Brit. 186,855, Nov. 21, 1921. Addn. to 184,271 (*C. A.*, **17,** 194). The process described in the prin-

cipal pat. is modified by using as a deflocculating agent a dil. aq. soln. contg. the pyrophosphate of an alkali base, *e. g.*, Na pyrophosphate. The clay may be subsequently recovered from its suspension by the process of flocculation described in 121,191 (*C. A.*, **13**, 647) or otherwise. Cf. *Ceram. Abs.*, **2** [3], 51(1923). (*C. A.*)

General

135. The swelling of sand upon absorption of moisture and its effect upon batch mixing. L. E. Norton. *Pottery Gaz.*, **47**, 1371–2(1922).—2% addn. of H_2O caused an expansion in the vol. of sand of no less than 12.4% and in some cases the max. increase in vol. was reached when but 1% of H_2O was added. Hence measurement of sand by vol. cannot be considered trustworthy if a batch mixt. of accuracy is desired. In the discussion several took issue with reported increase in volume of sand upon the addn. of such small percentage of water. J. W. H.

136. Manganese dioxide produced by chemical process in California. George J. Young. *Eng. Mining Jour.*, **114**, 880(1922).—Finely ground ore is digested with sulphurous acid and air. Soln. is treated with calcium nitrate. Copper originally in ore ppt. by Al. $CaSO_4$ sepd. from soln. by evapn. and filtering. Manganese nitrate dissoc. by heat: HNO_3 and MnO_2 separately recovered. The dioxide is high grade and especially adapted to demands of chem. and glass manuf. S. L. G.

137. Barytes, occurrence, mining, uses. Raymond B. Ladoo. *Eng. Mining Jour.*, **115**, 319–24(1923). S. L. G.

138. Forms of specifications for purchasing coal. Hubb Bell. *Proc. Am. Soc. Testing Materials*, **22**, Part II, 567–79(1922). J. L. W. (*C. A.*)

139. Rational basis for coal-purchase specifications. E. B. Ricketts. *Proc. Am. Soc. Testing Materials*, **22**, Part II, 557–66(1922).—An explanation of some of the points necessary to be considered in adopting a satisfactory specification. J. L. W. (*C. A.*)

140. Gas producers and producer gas. Victor Windett. *Blast Furnace Steel Plant*, **11**, 55–60(1923).—A discussion of what constitutes correct practice. J. L. W. (*C. A.*)

141. The determination of volatile matter in fuels. P. Wedgwood and H. J. Hodsman. *J. Soc. Chem. Ind.*, **41**, 372–4T(1922).—Monel metal and calorized steel crucibles were studied as substitutes for Pt in the Am. Chem. Soc. method for volatile matter. The dimensions were those of the Pt crucible. The results are consistent, but about 0.5% lower than with Pt, owing to oxidation of the crucible, less loss by entrainment, and the fact that 3 min. instead of 1 min. are required to reach 930°. Monel metal is the better; it was still good after 50 detns. E. W. T. (*C. A.*)

142. Clay in 1921. Jefferson Middleton. U. S. Geol. Survey, *Mineral Resources of U. S., 1921*, Pt. II, 105–10(preprint No. 18, publ. Sept. 20, 1922). E. J. C. (*C. A.*)

PATENTS

143. Vertical gas retort and producers. J. W. Drake. U. S. 1,444,498, Feb. 6. Two gas producers adjoin a vertical retort and a passage leads from each of the producers to a chamber common to and intervening between the retort and the producers. Another passage leads from the chamber mentioned to a chamber surrounding the vertical retort. A duplex valve is mounted between each of the producers and the chamber first mentioned. (*C. A.*)

144. Automatic governor for gas producers. G. R. McDermott. U. S. 1,444,383, Feb. 6. A blast-blower of a gas producer is steam-driven and the supply of steam for

driving the blower is automatically controlled by back pressure to maintain a uniform flow of air. (*C. A.*)

145. Apparatus for scrubbing coal gas. A. F. MESTON. U. S. 1,444,627, Feb. 6. The gas to be treated is passed in succession through an absorption chamber, a spray chamber and an elec. precipitator, arranged one above another. (*C. A.*)

146. Fire-resisting composition. C. E. WELLES. U. S. 1,436,618, Nov. 21. A fire-resisting mixt. adapted for addn. to ordinary paints is formed of ZnO 1–2 lbs., air-slaked lime 1–2 lbs., linseed oil 1 qt., H_2O 1 pint, kerosene 1 pint, "sol. glass" (30–35° Bé.) 2–4 oz. and molasses 1–2 oz. (*C. A.*)

BOOK

A Bibliography of Colloid Chemistry HARRY N. HOLMES. The National Research Council has recently issued a Colloid Bibliography in mimeographed form, by Dr. Harry N. Holmes of Oberlin College, Chairman of the National Research Council Committee on the Chemistry of Colloids, a book of 135 pages containing 1800 references on 106 topics. All the references are classified and many are accompanied by brief comment. This book may be purchased from the Washington office at $1.00.

CERAMIC ABSTRACTS

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Art

1. Zircon for white glazes. P. P. Budnikov. *Tonind. Ztg.*, **47,** 173–4(1923).—Sn for the production of opaque glazes is becoming too expensive and difficult to get. Antimony (Sb_4O_6) produces opaque glazes with good color and gloss. Arsenic (As_2O_3) produces beautiful transparent white glazes and also opaque white glazes but they are not very durable and are destroyed by firing at high temps. A glaze contg. bone ash develops a scum on the surface. The best products are produced with cryolite. In order to get a better bond between the glaze and body small amts. of zinc oxide (ZnO), lime (CaO), etc., are added. The glazes produced with zircon compds. are much more dependable. 5% of the oxide of zircon (ZrO_2) gives a thorough white opaque glaze. Still better results are obtained with a mixt. of tin oxide (SnO_2) and a zircon prepn. By the introduction of ZrO_2 in the glaze the m.p. is raised. It was found that when the Sn and Zr are introduced as hydroxides they have a better covering power. This is due to the fact that the hydroxides are finer grained. The following glazes were used by B.:

Glaze 1		Glaze 2	
Oxide of zircon	5	Oxide of tin	7
Red lead	24	Oxide of zircon	3
Kaolin	10	Red lead	32
Soda ash	14	Silica	35
Calcium carbonate	1	Kaolin	10
Zinc oxide	1	Soda ash	12
Silica	35	Zinc oxide	1

H. G. S.

2. Note Books of Josiah Wedgewood. Bernard Moore and J. W. Mellor. *Pottery Gaz.*, **48,** 619–26(1923).—Quotations from original manuscripts of Josiah Wedgewood are given and they show that many ideas considered modern were worked out carefully as far back as 150 yrs. ago. J. W. H.

3. The romance of pottery. F. A. Rhead. *Pottery Gaz.*, **48,** 626(1923).—An address. J. W. H.

4. Uranium glazes. Mikiya Akatsuka. *Rept. of the Pottery Lab.* (Kioto), **1,** 57–73(1922).—*1. Vermilion glaze.* Raw glaze (b) composed of 35 white lead, 10 quartz and 8 ammonium uranate, $(NH_4)_2U_2O_7$, has produced a brilliant vermilion at cone 012a–011a. An addn. of Funori glue is recommended. It was applied 3 times as thick as ordinary porcelain glazes on vitrified porcelain biscuits. *2. Red glaze.* Replacing 1 part of the uranate with 1 part of ferric oxide in the glaze (b), a brownish red was obtained. *3. Crystal and luster.* The appearance of the glaze (b) changes with firing temp., thus:

Cone	012a	01a	1a	1a–2a	5a	8–9
Fuel	wood	coal	wood	coal	coal	coal

Color of glaze	vermilion	reddish orange	blackish brown	reddish brown blackish brown or reddish orange	yellowish green vermilion or blackish red	blackish brown
Color of crystal	.....	....	gold	crimson or green	green	....
Color of luster	.....	....	....	.....	greenish purple	gold or purple

4. Crystal glazes. The following table shows glaze batches and temperatures at which crystal glazes were developed:

Glazes	P	Q_1	Q_2	R	S
White lead	70	75	75	70	70
Ammonium uranate	16	15	15	15	16
Quartz	20	19	16	18	20
Rutil	7	7	8	3	..
Cobalt carbonate	..	0.5	1	..	0.5
Zinc oxide	..	..	..	5	..
Cone	5a,6a	5a	5a,6a	5a,8	1a

When a flower vase was glazed with R, set in a sagger which was coated with a glaze composed of 37 white lead, 8 quartz and 11 ammonium uranate, and burned to cone 5a, very fine golden small crystals were developed on bright glaze of same color.

S. KONDO

Cement, Lime and Plaster

5. Reagents used in etching cement clinker for the examination of its microstructure. The microscopic study of cement clinker. III. TAKEHIRO HATTORI. *Rept. Indus. Dept. Central Research Lab.* (Govt. of Formosa), **1,** 1–6(1922).—Thin sections of clinker can not be easily prepd., owing to its porous and friable nature. Therefore, a method which consists in polishing a single surface of the specimen, developing the structure by etching with a suitable reagent, and examg. under vertical illumination is usually used. Water and dilute soln. of HCl in alcohol have been recommended as the reagents. The author has tried other reagents for the purpose. Generally speaking, the sections of Port. cement clinker consist of cryst. grains (alite) and filling substances. The filling substances do not react uniformly with etching agents. Some portions of the filling substances in polished but unetched sections look gray under vertical illumination and are easily etched, while other portions are white and resist reagents better than the former. Eutectic structure is frequently observed in the filling substances. There are also grains which resemble alite but show different resistance to reagents. White substance was not attacked by water even when the section was immersed for 24 hrs. in it. Soln. of cane sugar retards the setting of the cement when its concn. is weaker than 0.5%, while it accelerates the setting when its concn. is stronger than 1%. When sections were treated with the 0.2% soln. for 5 min. the eutectic structure in the gray substance was distinctly developed as white spots. When sections were treated with the 10% soln. for 5 min. grains resembling the cryst. ones appeared. The author considers them as free lime. In conclusion, the author recommends the use of am. oxalate or am. sulphate for examg. distribution of alite crystals and the use of calcium chloride or cane sugar for the observations of gray substance. S. KONDO

6. Effect of aeration on the properties of Portland cement. TAKEHIRO HATTORI.

Rept. Indus. Dept. Central Research Lab. (Govt. of Formosa), **1**, 7–24(1922).—Influence of aeration of 4 Port. cements on market upon their various properties are described. The aeration was effected by spreading the cement in a shallow box and turning it over once a day. *1. Loss on ignition.* Loss on ignition increases with the time of aeration. A cement has shown 0.64%, 1.72%, 3.90%, 5.74%, 8.23% and 10.74% ignition-loss at the end of 0, 1, 4, 8, 13 and 20 weeks, respectively. *2. Constancy of volume.* Linear expansion of test pieces made of a cement with Le Chatelier's mold was measured by immersing them immediately in water. The average increase in length after 24 hrs. was as follows:

Time of aeration	0	3 days	2 weeks	4 weeks	8 weeks	20 weeks
Expansion in mm.	0.7	0.3	0.6	0.3	0.1	0.1

3. Time of setting. Aeration first retards the setting, then accelerates it and a further aeration retards it again. *4. Strength.* In general, the strength of a cement is decreased by aeration. Besides, tables and curves showing heat evolved in setting are shown. The author discusses the influence of free lime on various properties of the cements. S. KONDO

7. Slag cement and dolomitic cement. SABURO KIMURA. *Central Research Lab.* (The South Manchurian R. R. Co.) *J. Jap. Cer. Assn.*, **364**, 595–608(1923).—*A. Slag cement.* Tensile strength of numerous mortars composed of granulated blast-fur. slag of the Anzan Iron works or the Honkeiko Iron Works, Portland or natural cement, slaked lime and sand have been studied. To cite some of the results on the Anzan slag which was ground to pass through a sieve with 2500 meshes per sq. cm. and contained 36.97 sol. silica, 1.08 insol. matter, 11.86 alumina, 0.40 ferric oxide, 44.83 lime, 2.52 magnesia, 0.66 sulphuric anhydride and 1.64 sulphur, we have:

Propn. in wt.				Tensile strength, kg./sq. cm.			
Slag	Port. cement	Sand	Seawater per cent	7 days	28 days	3 months	6 months
...	1.0	3.0	8.3	15.3	20.0	23.4	25.8
0.9	0.1	3.0	8.8	8.0	22.4	24.5	26.0
0.8	0.2	3.0	8.3	8.4	22.5	25.8	26.0

Slag accelerates setting of Port. cement, thus:

Propn. in wt.			Setting time, hour, min.		
Slag	Port. cement	Fresh water per cent	Temp. in °C	Initial set	Final set
...	1.0	25.0	20.5	6.04	9.52
0.7	0.3	43.0	20.5	1.12	6.03

B. Dolomitic cement. Tensile strength of dolomitic cements which were prepared by calcining four kinds of Manchurian dolomite for several hrs. at 600–700°C and then by grinding them to pass through a 900-mesh sieve was tested. The strength and hydraulicity increase with its content in sol. silica. Some of the results obtained with a dolomite contg. 19.14 sol. silica, 0.66 insol. matter, 1.10 alumina and ferric oxide, 27.74 lime, 22.41 magnesia and 28.34 loss on ignition are as follows:

Propn. in wt.					Tensile strength, kg./sq. cm.	
Calcined dolomite	Port. cement	Calcined pegmatite	Anzan slag	Sand	14 days	28 days
...	1.0	...	...	3.0	17.9	25.0
1.0	...	...	...	3.0	6.9	15.0
0.9	0.1	...	...	3.0	6.9	11.9
0.9	...	0.1	...	3.0	8.1	12.5
0.9	...	...	0.1	3.0	15.0	19.4

Thus, dolomitic cement with small addn. of blast-fur. slag is a good hydraulic cement and can be used as a substitute for white Port. cement, as it can be prepd. nearly pure-white. S. KONDO

8. Fast hardening cements. (Fused cements.) ANON. *Rev. Mat. Constr. Trav. Pub.*, **162,** 49–52(1923).—Fused cement is made from limestone and bauxite (silicate of alumina) by heating the mixt. in a fur. till liquefied, and running it out to cool and solidify. The mass is crushed and then ground very fine, analyzing in per cent, SiO_2 10, Al_2O_3 40, Fe_2O_3 7, CaO 43, as compared with Port. cement SiO_2 22–23, Al_2O_3 6–7, Fe_2O_3 2–3, CaO 57–66. Fused cement sets slowly but afterwards hardens rapidly, the setting beginning to take effect 3 hrs. after mixing, and complete in 4–8 hrs., behaving like Port. cement. The setting of fused cement alone is accompanied by a great evolution of heat. The rapid hardening is illustd. by the fact that in a mortar the fused cement gains its full strength in 18 hrs., whereas it takes a month for the Port. cement.

Tensile strength	Kgms. per sq. cm.				
	18 hr.	2 d.	7 d.	28 d.	3 m.
Pure cement	..	..	..	..	..
Fused cement	39	62	68	77	77
Portland cement	..	25	48	52	56
1:3 mortar	..	..	..	..	..
Fused cement	38	41	43	40	39
Portland cement	..	14	28	35	37

For concrete mixts. of 1 m.^{3} of gravel, $^1/_2$ m.^{3} of sand, and varying quantities of cement the compression strengths are:

Concrete made with	Hectopiezes[1]				
	24 hr.	48 hr.	7 d.	14 d.	28 d.
Fused cement 150 kgms.	77.2	71.2	73.5	..	..
Fused cement 200 kgms.	93.7	145.1	152	..	..
Fused cement 250 kgms.	214.5	194.6	191.1	..	..
Port. cement 250 kgms.	...	22.1	57.1	93.7	82.7

[1] The Hectopieze is the authorized unit of pressure, 1.02 kgms. per sq. cm.

Action of gypsum. The screened hardened cement when mixed with $^1/_2$ of its wt. of gypsum and moistened does not swell, whereas Port. cement treated in a similar manner decomposes and swells to many times its size. LOUIS NAVIAS

9. New facts about "ciment fondu." ANON. *Rock Products,* **26,** 29(1923).—A series of tests of this quick-setting cement, which is a French product, were conducted recently by the Boston Elevated Ry. Co., the results of which are tabulated below. 3 well-known brands of Amer. cement and the specifications of the A.S.T.M. for 1921, were used in the comparison with *"ciment fondu."* 3 different mixes of *"ciment fondu"* were used. Figs. were obtained on the amt. passing through a No. 200 sieve, the time of initial set and final set, the strength of the French cement after 24 hrs., the strength of all cements of the 1 to 3 mix after 7 and 28 days, and the results of a 5-hr. boiling test. Sep. tests were made of the one-to-two and one-to-one mixes of *ciment fondu.* From the results it will be noted that the French cement obtained a strength in 24 hrs. greater than any of the standard cements did in 7 days and that the 7 day test of the French cement is greater by 15% than the 28 day test of the others. On the 28 day

TABLE I

COMPARATIVE TESTS OF 1–3 MIXTURE

Make	Initial set	Final test	Per cent passing No. 200 sieve	24-hr. tensile	7-day tensile	28-day tensile
A.S.T.M.	0.0 hr. 45 min.	10 hr. 0 min.	78	...	200	300
"A" Brand	2 hr. 40 min.	6 hr. 10 min.	85.2	...	348	377
"B" Brand	2 hr. 50 min.	5 hr. 40 min.	85.4	...	271	300
"C" Brand	3 hr. 20 min.	7 hr. 25 min.	85.0	...	282	356
French	3 hr. 5 min.	6 hr. 20 min.	96.4	376	423	...

COMPARATIVE STRENGTH OF DIFFERENT MAKES OF CIMENT FONDU

Mixture	24-hr test	7-day	28-day	Per cent of strength
1 cement 3 sand	376 lb.	423 lb.	407 lb.	4.0
1 cement 2 sand	578 lb.	725 lb.	671 lb.	7.25
1 cement 1 sand	685 lb.	1,112 lb.	1,178 lb.	3.0

test it showed a slight loss in strength compared with that at 7 days. This cement, however, did not stand up well under the 5-hr. boiling test, as it cracked and scaled.

O. P. R. O.

10. Setting of Portland cement. BRIT. PORT. CEMENT RESEARCH ASSN. *Pamphlet*, **1**(1922).—This pamphlet gives the results of investigations by the Brit. Portland Cement Assn. into the cause of changes in the setting time of Port. cement. The summary of results is as follows: *Storage of cement out of contact with air.* 6 diff. samples of commercial cements, and 1 sample of pure cement (prepd. from rotary clinker without any addn. of water, steam or gypsum) when kept in sealed bottles for 4 and 6 mos., retained their original character of setting time, were unaffected by fluctuations of temp., and were independent of light or darkness, or the presence or absence of added gypsum. Exposure of cements to gases: (*a*) Pure dry air, oxygen and ozone had no effect on the setting time. (*b*) Moist air, oxygen and ozone retarded the set of all cements. (*c*) Dry carbon dioxide accelerated the setting time. (*d*) Moist carbon dioxide accelerated the set enormously, the character of the cements being entirely changed. All the above results were independent of the presence or absence or added gypsum. (*e*) Ordinary unpurified air had an uncertain effect on setting-time. 3 cements were quickened to a more or less degree, 2 were hardly affected, and 1 was somewhat slowed. In each case the effect on setting-time could be traced to the relative percentages of carbon dioxide and water absorbed or lost. (*f*) Exposure of the same sample of cement first to moist air (free from carbon dioxide) and afterwards to carbon dioxide, resulted in the setting time being first retarded and then accelerated. *Effect of addition of salts.* (*a*) The carbonates of soda, potash and ammonia accelerated the setting-time, the first 2 very strongly. (*b*) Sulphates, in general, accelerated the set. Except gypsum and small propns. of plaster of Paris, very few sulphates had a retarding effect and these all contained water of crystn. (*c*) Chlorides also, as a rule, accelerated setting-time, but the effect was, generally speaking, not very pronounced. (*d*) Nitrates, generally, had no very definite effect. (*e*) The hydroxides employed, including slaked lime, all accelerated the set of cements to a greater or less degree. (*f*) Borax had a similar effect, especially the crystd. salt. *Effect of crystd. water in salts.* (*a*) Anhydrous sodium carbonate, whether dissolved in the gaging water, or ground with the cement beforehand, had a strong accelerating effect on setting-time. (*b*) Crystd. sodium carbonate, dissolved in the gaging water, had a similar action. (*c*) Crystd. sodium carbonate, ground with the cement 24 hrs. beforehand, had considerably less action in quickening the setting-

time. (*d*) Anhydrous sodium carbonate ground with the cement 5 to 9 weeks before testing, greatly accelerated the set. (*e*) Crystd. sodium carbonate, ground with the cement 5 to 9 weeks before gaging, but little affected the setting of the cement, its slow-setting character being retained. (*f*) Quick-setting (ignited) cement, in contact for 6 hrs. with crystd. sodium sulphate or crystd. magnesium nitrate under pressure, became very slow-setting. (*g*) Cement, already slow-setting, was less affected by crystd. water expelled by pressure, but nevertheless absorbed a propn. of the crystd. water and became slower. *Summary of conclusions.* (1) The setting time of cement does not change of itself, even after prolonged storage out of contact with air. There is, therefore, no apparent spontaneous alteration in chemical composition or physical structure. (2) The time of set of cement appears to depend upon the proportion of combined water present in hydrated calcium aluminate or silicate, which tends to form a protective sheath or coating round the particles of cement and resists or delays the penetration of water to the active core. The greater the quantity of water absorbed by, or combined with, the cement, the more impervious is the protective sheath or film and the slower is the time of set. On the other hand, the setting is accelerated by any influence which abstracts water from the cement, or which attacks and destroys or modifies the sheath of hydrated material, thereby enabling the gaging water to penetrate more quickly to the active core of the particle. (3) Changes of setting-time (as when cement is stored) are brought about only by outside influences—*e. g.*, carbon dioxide and water vapor or active salts, which abstract water from, or act upon the protective sheath of hydrous material coating the grains. (4) Cement is capable of abstracting water from salts containing water of crystn. with which it lies in contact for some weeks. Such abstracted water hydrates the cement particles and retards the time of set. (5) Cement, in contact with salts containing water of crystn. which have part of such water expelled by pressure will under these conditions combine with the expelled water and become slower-setting. (6) The setting-time of cement, resulting from the partial hydration of the particles, remains unchanged provided the material is not subjected to outside influences which affect the hydrous film coating the grains. (7) The reason for the acceleration or retardation of setting-time by sol. salts is not sufficiently clear to warrant a definite conclusion being drawn as to whether the action is catalytic or not. In some cases, chem. reaction undoubtedly occurs (*e. g.*, with ammonium salts, and ferric sulphate) and it is reasonable to surmise that the action in other cases is also chemical. It does not, however, appear that the alteration in setting time, brought about by the addn. of salts, is directly due to the formation of double salts, except perhaps when the double sulphate of lime and alumina is formed. In several instances the effect on setting-time appears to be clearly dependent upon the presence or absence of crystd. water in the salt used. (8) The results of this research lead to the conclusion that the use of gypsum as a retarder is sometimes uncertain and irregular in its effects. On the other hand, the regulation of setting-time by hydration, through the medium of steam or water appears to be more permanent. In practice, the regulation of setting time by hydration alone is not generally adopted by manufacturers and some further investigation as to the relative advantages of gypsum and water (or steam) as hydrating agents is desirable.

O. P. R. O.

11. Magnesium oxychloride cements. M. Y. Seaton. *Chem. Age* (N. Y.), **31,** 17–22(1923).—Mg oxychloride cement was originally made by Sorel in 1867. It is important as a binding material because it attains high strength at an early age even with free exposure to air. It does not exhibit a high vol. change due to temp. changes or other causes. The raw materials, mfg. process, selection of suitable aggregates, and the use of oxychloride cements are discussed. Cf. *Ceram. Abs.*, **1** [7], 192–3(1922).

J. C. W. (*C. A.*)

12. Physical properties of dental cements. II. PAUL POETSCHKE. *Ind. Eng. Chem.*, **15**, 339–42(1923); cf. *C. A.*, **10**, 1226.—Methods and app. are described for detg. the heat generation, texture, permeability and setting time of Zn oxyphosphate cements. The heat generated in setting varies considerably in different brands. The heat can be varied greatly by the rate of addn. of powder to liquid and the time of mixing. By proper mixing no brand should cause damage. Crushing strength is directly proportional to heat generation, cements evolving the most heat having the highest crushing strength as well as the finest texture. The texture varies from fine vitreous to coarse chalky. The latter texture is the more permeable to aq. fluids. Cements of fine vitreous texture are impermeable to dye solns. Com. designations for hardness such as "slow," "rapid," etc., are of slight significance, for there is recognized no standard time of set. A cement setting at room temp. relatively faster than another may be relatively slower at body temp. Those showing the greatest strength, the finest texture, the least permeability and the greatest heat liberation on setting show the greatest increase in strength between the 15-min. and 24-hr. period of setting. The ideal cement should set slowly at room temp. and rapidly at body temp. C. C. D. (*C. A.*)

13. Thermochemical research on cement. R. NACKEN. *Zement*, **11**, 245–7, 257–8(1922).—N. deals with the drying of cement in rotary driers at about 500°, the expulsion of CO_2 at 900°, incomplete burning between 1000 and 1250°, in which stage exothermic reactions occur, burning at 1250°, and finally strongly burning at 1400° or higher. The development of heat in the burning of cement is slow below the stage at which CO_2 is expelled. The heat of reaction begins to increase slowly at 930° and rises from 120 to 500 cals. per g., then more slowly to 600 cals. per g. The max. is at about 950°. As soon as the CO_2 is expelled, a vigorous reaction occurs, *i. e.*, the formation of Ca silicates and aluminates, this reaching a max. at 960°, after which equil. is very quickly reached. Different results obtained in tech. practice are due to heterogeneity of the raw materials and the fact that some Ca carbonate has escaped burning until the end. It is calcd. that the quantity of heat required to burn 1 kg. of clinker up to a temp. of 1400° is about 900 cals. J. S. C. I.

14. Improvements in the manufacture of magnesia cement. B. HAAS. *Chem.-Ztg.*, **46**, 88–9(1922).—Crude $MgCl_2$ liquors contg. KCl, NaCl, and $MgSO_4$ so often used in making MgO-$MgCl_2$ cement make a product which dries more slowly, has less hardness, discolors more easily and requires more mechanical treatment but shows less blowing and sweating than one made from a pure $MgCl_2$ soln. of the same concn. Because of such properties and the greater cost of transport of liquor, the relative economy of the 2 methods must be calcd. for each case. Pure $MgCl_2$ solns. for a given purpose should be made 2–3° Bé. less concd. than the proper crude liquor. $MgSO_4$ is of advantage in preventing discoloration and blowing, particularly if weathering occurs under warm and dry conditions. Because of its cost, $MgSO_4$ can be replaced by by-product kieserite. This has proved so efficient that all $MgCl_2$ has been replaced by kieserite and the product is non-hygroscopic and free from blowing, though the rate of drying and hardening is slower and the strength and toughness are less. By replacing $MgCl_2$ by 15% more than its equiv. wt. of kieserite, a product is obtained with satisfactory tenacity. Replacement of part of the $MgCl_2$ by metallic salts, particularly Fe salts, gives a product with less blowing and sweating and with toughness, color and good hardening qualities. Fe salts can also be used advantageously with $MgSO_4$ or with kieserite to obtain pleasing colors. C. C. D. (*C. A.*)

PATENTS

15. Plaster or cement. H. S. THATCHER. Can. 228,860, Feb. 20, 1923. Finely divided kieselguhr is mixed with finely divided calcined gypsum. (*C. A.*)

16. Hardening plaster, mortar or cement containing lime. J. PELC. U. S.

1,447,568, Mar. 6. A mixt. of NaH sulfate and CaF_2 is added to accelerate hardening. (*C. A.*)

17. Waterproofing reagent for concrete. Sei Oki. Japan. 40,198, Oct. 4, 1921. Pptd. residue obtained from soy-bean oil is partly sapond. and $BaCl_2$ soln., kieselguhr and $Al(OH)_3$ are added. The product is dild. with H_2O and used for mixing cement for concrete, etc. (*C. A.*)

18. Fibrous wall-board. J. H. Caffrey. U. S. 1,447,708, Mar. 6. A mat of loose fibers is coated with a liquid cement, the fibers are sepd. in places to form openings and the material is then compacted under pressure. (*C. A.*)

BOOK

19. Die Portlandzementfabrikation. Carl Naske. 4th Ed. revised. Leipzig Th. Thomas. 469 pp. (*C. A.*)

Enamel

PATENTS

20. Method of enameling. Eugene Berninghaus. U. S. 1,452,635. The method of producing enameled chair sections which comprises applying an annular coating of fused enamel to the exterior of an annular sheet metal chair section having inwardly turned opposite edges by rotating said section with its exterior surface including portions of said inwardly turned edges in contact with a bath of fused enamel.

21. Enameling oven. D. Leissler. U. S. 1,447,795, Mar. 6. The oven is adapted for baking glazed articles. (*C. A.*)

Glass

22. Heat resisting glasses. W. E. S. Turner. *Pottery Gaz.*, **48**, 607–17(1923).—The tendency of glass to fracture was at first attributed to lower thermal cond. of glass, so that, on heating it, the slow flow of heat across its walls resulted in great tension on the colder layers not exposed to source of heat. But relative cond. for heat alone does not entirely account for the fracture. The term "thermal endurance" was introduced by Winkelmann and Schott to denote the power of a glass to withstand thermal shock, and the formula which was deduced to represent the relationship of thermal endurance, F, to other properties was $F = \frac{T}{E\alpha}\sqrt{\frac{K}{Dc}}$ where T is the tensile strength; E, Young's modulus of elasticity; α, the linear coefficient of thermal expansion; K, the conductivity for heat; D, the density; and c, the sp. ht. It can be noted that the properties which directly affect the thermal endurance are tensile strength, elasticity, and the coeff. of expansion, the remaining three factors producing an effect proportionate either directly or inversely to their square roots. Hence attempts to improve heat resisting power of glasses have been either in the increasing of mechanical strength or of diminishing the coefficient of expansion. Schott was successful in making glass articles of which the inner part had a lower coeff. of expansion than the outer, and when the glass cooled, the inside layer was in compression. This type fell under increase of mechanical strength, Coeff. of expansion of glass is intimately connected with its compn. and it has been found possible to make glasses having linear thermal expansions varying bet. 30 and 130×10^{-7}. Schott showed that different constituent oxides had *each* a definite effect on the total expansion of the glass and in conjunction with Winkelmann, so-called "expansion factors" were detd. The expansions were found to be additive and permitted of calculation from the formula $3\alpha = p_1a + p_2b$. p_1,p_2 being the respective percentages and a,b being the expansion factors for the constituent oxides. The following expansion factors were calculated by Winkelmann and Schott:

B_2O_3	0.1	Li_2O	2.0
MgO	0.1	BaO	3.0
SiO_2	0.8	PbO	3.0
ZnO	1.8	CaO	5.0
P_2O_5	2.0	Al_2O_3	5.0
As_2O_5	2.0	K_2O	8.5
		Na_2O	10.0

The expansion factors represent the contribution which each 1% of the particular oxide made to the total cubical expansion of the glass. It has been found that some of Winkelmann and Schott's factors need revision, the effect of magnesia, for example, not being as advantageous as the earlier factor. It will be seen from the table of expansion factors that two oxides in particular, namely, silica and boric oxide are associated with small expansion. The following analyses of 6 types of heat resisting glasses will illustrate the extent to which the 2 oxides have been used in modern times:

	Kavalier's combustion tubing	Austrian "Sun brand" lamp glass	Jena Thermometer 591	Jena "Best" lamp glass	British miners lamp glass	Pyrex glass
SiO_2	79.57	76.78	71.95	73.88	64.1	80.62
B_2O_3	...	...	12.00	16.48	22.0	11.90
As_2O_5	...	...	...	0.73	trace	0.66
Sb_2O_5	...	...	...	...	1.1	...
Al_2O_3	0.32	0.72	5.0	2.24	1.9	2.00
Fe_2O_3	0.04	trace	...	trace	..	0.14
CaO	7.80	6.52	...	trace	0.5	0.22
MgO	0.11	0.24	...	trace	0.1	0.29
PbO	...	...	...	...	0.6	...
Na_2O	0.66	11.14	11.0	6.67	9.7	3.83
K_2O	11.60	4.74	...	trace	..	0.61
Coefficient of linear exp. A	69.8×10^{-7}	83.0×10^{-7}	64.5×10^{-7}	46.7×10^{-7}	56.3×10^{-7}	$37.2\times10^{-}$
Coefficient of linear exp. B	.....	.....	57.0×10^{-7}	.....	.....	$32.0\times10^{-}$

A. Calculated by Winkelmann and Schott's expansion factors.

B. Experimental 0° to 100°C.

Linear expansion (thermal) of ordinary soda lime glass about 100×10^{-7}.

Linear expansion (thermal) of ordinary potash lead glass about 90×10^{-7}.

The modern glass contains boric oxide in very considerable amount. Pyrex glass, the most notable of glasses in recent years, contains roughly 80% of silica and 12% of boric oxide. There is a tendency in the manuf. both of chem. and heat resisting glassware, to make them strongly acid in character, since the acid oxides, silica and boric oxide are far superior to the basic oxides in giving low expansion. So far as the use of other oxides is concerned, the field is not exhausted. Thus, zirconia has a linear expansion coeff. of 8.4×10^{-7}, only little inferior to fused silica, but with a melting point of about 2600°C, clearly this oxide is first likely to find use, not in the pure, fused state, but as an addition to silica and the same is true of other refractory oxides such as titania and thoria. Some preliminary attempts have been made to produce glasses by adding small amts. of titania and zirconia to silica, the objects being to increase the resistance of the fused silica to devitrification and to attack by basic materials. The general results stated to be achieved are the production of a glass having superior mechanical properties and thermal properties to vitreosil, although actual numerical data have not been quoted. At Sheffield it has been found possible to add both zirconia and titania to the

ordinary glasses and it is hoped that the announcement of the results will soon be forthcoming. It may be noted, however, that when several per cent of titania is present, small crucibles of glass can be cooled down without special precautions to yield unbroken lumps. This indicates either a reduced thermal expansion or an increased mechanical strength: in any case an improved heat resisting glass. In the presence of reducing gases titania glass tends to be dark brown in color, although it is possible to retard such color development. Progress in the endeavor to increase the mechanical strength of glass might first profitably be made in a systematic detn. or redetn. of the relationship between the tensile, compression and other mechanical properties and the chem. compn. The Jena workers have already drawn certain conclusions as to the effect of different constituent oxides and additive relationships established, but in the author's view, their results need revision. As to the possibility of heat treatment, it is to be remembered that until devitrification sets in, glass contains no crystalline structure, the units of which could have their boundaries modified, as is possible in metals by cold working or by heat treatment. Owing to its brittleness, glass hardened by quenching possesses an element of risk, as when the outer layers are broken through, the mass is at once reduced to powder. J. W. H.

23. Coloring glasses with cobalt compounds. Kitsuzo Fuha. *J. Jap. Cer. Assn.*, **364**, 587–95(1923).—Coloring action of cobalt compds. on various glasses has been studied. Formula of basal glass was $R_2O.RO.3SiO_2$,$R_2O.RO.O.5B_2O_3.3SiO_2$, $1.3R_2O.RO.6SiO_2$ or $R_2O.B_2O_3.6SiO_2$, in which R_2O is Na_2O or K_2O and RO represents CaO, MgO, ZnO, BaO or PbO. Results: (1) Color produced by CoO is stable and accordingly is alike for almost all kinds of glass except pink shade in soda glasses which can be distinguished from potash glasses only when amount of the oxide is small (2) no diff. in coloring power was observable between cobalt carbonate and cobaltocobaltic oxide, Co_3O_4, obtained by igniting cobalt nitrate, if equivalent amounts were used (3) addn. of small amt. of alkali nitrate, potassium tartarate or arsenious acid to the batch had no influence on the coloring. Cf. *Ceram. Abs.*, **2** [3], 58(1923). S. Kondo

24. Temperature in pot furnaces. Sangoro Takahashi (Tokio Electric Co.). *J. Jap. Cer. Assn.*, **364**, 609–18(1923).—The author performed numerous expts. with two pot-furnaces having 10 or 16 covered pots and gives detailed descriptions or discussions on (1) calorific power of their coal (2) ht. required for melting their glass batch (3) compn. and calorific power of their producer gas (4) amt. of air required for the complete combustion of the producer gas (5) the theoretical combustion temp. (6) lowering of the temp. due to the heat absorption of the glass-batch and the conduction through furnace-walls (7) variation in the climate in Tokio (8) influence of climate on the draft of their stacks, (9) lowering of furnace-temp. due to wet coal, (10) measured temp. in their fur. and also (11) on the influence of season upon the cracking of glass pots. Heat utilized in melting batch was 8.6%, in a half-gas fired fur. "A" contg. 16300 kg.-pots, and 10.4%, in a Mond-gas fired fur. "B" contg. ten 250 kg.-pots, of that generated in each fur. by the combustion of the gases. Heat lost by conduction through fur. walls amounted to 15.9% in "A" and 19.0% in "B." The mean max. temp. observed close to pots was 1522°C in "A" and 1517° in "B." S. Kondo

25. Glass manufacture. Anon. *Raw Materials Rev.*, **2**, 154.—A part. of app. for molding glass is made from steel containing from 10 to 15% of chromium and from .5 to 5% of cobalt. Another suitable steel contains about 13% of chromium, about .5% of manganese, about .6% of cobalt and about .35% of carbon. Another steel contains chromium and about 4% of silicon. It is found that molds made from these steels have a longer life than molds made from cast iron, and that they are particularly suitable for use with a glass that requires to be worked at a high temp. O. P. R. O.

26. Glass forming machines. C. Saxton. *Pottery Gaz.*, **48,** 629–34(1923).—A very complete description of the principles of various glass mfg. machines and the methods employed in the production of the various types of glass ware. J. W. H.

27. Feldspar for the glassmakers. F. C. Flint. *Pottery Gaz.*, **48,** 670–71(1923).—See *Jour. Amer. Ceram. Soc.*, **6** [3], 413–6(1923). J. W. H.

28. Sanitary measures in milk industry safeguarded by constant watchfulness. Glass bottle and automatic machinery greatest factors; makes complete sterilization possible. Anon. *Glass Container*, **2** [7], 11, 12(1923).—Sterilization is observed by testing unfilled bottles many times a week in order to test the performance of each type of washing, rinsing and filling machine. Efforts to avoid contamination are practiced throughout the whole industry. W. M. C.

29. A study of the return and breakage problem of milk bottles. Anon. *Glass Container*, **2** [7], 1, 5, 6, 7, 46(1923).—Report of a survey by the Glass Container Association among the milk dealers in N. Y. City. It is estimated that 1,600,000 milk bottles are delivered in N. Y. each morning. The av. bottle makes 17 trips where formerly it made eleven. Improvement has come about as a result of checking up on delivery system and plant operations. Mechanical handling of milk bottles and the use of latest types of washing machines, conveyers, filling, sterilizing and capping machines have reduced breakage to less than 2%. Sterilizing is performed at 160°F, washing at 120°F, and rinsing at 100°F. Proper temp. regulation lessens breakage. W. M. C.

30. Fused quartz, silica glass or fused quartz. Elihu Thomson. *G. E. Rev.*, 68–74(1923).—Articles with illus. on the prepn., properties, and uses of quartz glass. W. M. C.

31. Abrasives and polishing powders for glass. J. W. French. *Trans. Faraday Soc.*, Oct.(1922).—The action of an abrasive is outlined briefly; rate of abrasion depends on size of grain, force of impact, number of impacts per unit time, and is propnl. to the load on the tool and also to relative speed of translation. Several typical abrasives are illustd. and their relative merits discussed, namely diamond splinters, carborundum, emery and rounded grains of sand. The action of polishing is discussed in detail. Polishing media, of which the best is ferric oxide or rouge, are referred to also. Innumerable scratches when a polished surface is etched is a series of minute percussion cracks which are quite invisible until the edges of the cracks have been opened by etching. The moment the etching vapor strikes the surface of the glass, the scratches flash instantly into view. Hitherto the assumption has been that a surface layer has been dissolved away, thus exhibiting underlying scratches. O. P. R. O.

32. The silvering of glass. Anon. *Optician*, **60,** 183(1920); *J. Soc. Glass Tech.*, **5,** 125.—Several methods are described. The first requires 4 solns. as follows: (1) 40 g. of crystd. $AgNO_3$ in one l. distd. water; (2) 6 g. of NH_4NO_2 in 100 g. of water; (3) 10 g. of KOH in 100 g. of water; (4) 25 g. of sugar in 250 g. of water; add 3 g. of tartaric acid, boil for ten min. and allow to cool, then add 50 cc. of alc. and dil. with water to 500 cc. All these solns. can be kept without undergoing alteration. Equal quantities of the 4 solns. are mixed and the glass is immersed in the mixt. with the side to be silvered facing downwards. The second method is a modification of Brashera's process. NH_3 is added to a 10% $AgNO_3$ soln. until the ppt. is re-dissolved; to the total vol. half as much of a soln. of KOH is added, and then more NH_3 until the mixt. is clear. A weak soln. of $AgNO_3$ is further added until a bright brown tint results. Silvering is carried out by using a mixt. of this and a sugar soln. contg. 10% of sugar, 10% of alc., and 0.5% of HNO_3. The side of the glass to be silvered should be on top. For another method, two solns. are used: (*a*) 8.5 g. of $AgNO_3$ in 200 g. of water; (*b*) 15 g. of Rochelle salt in 200 g. of water. NH_3 is added to the mixt. until the ppt. is almost re-dissolved and the soln.

filtered. Two solns. are also used in a fourth process: (1) sugar 20, HNO_3 4, alc. 175, water 1000 parts; (2) 15 cc. of a 1% $AgNO_3$ soln., 7.5 cc. of a 0.5% KOH soln., and 22 cc. of NH_3. NH_3 is added to the $AgNO_3$ soln. until the ppt. is re-dissolved then the KOH soln., and finally the rest of the NH_3. Soln. (1) improves with age; 170 cc. of it are added to soln. (2) as made. Looking-glasses can be silvered simply by employing a mixt. of a 1% $AgNO_3$ soln., which has been treated with NH_3 until the ppt. has nearly disappeared, and a 1% formalin soln. The surface to be silvered should be placed downwards. In all cases abs. cleanliness of the glass is essential and directions are given for ensuring this. H. G. (*C. A.*)

33. Notes on reheating of glass electrically. E. F. Collins. *Glass Ind.*, **3**, 223 (1922).—Glass is athermous to heat rays. At 100° 2.6 mm. of glass intercepts all heat radiations, and at 390° it intercepts all but 6%. The ratio of convected heat to radiated heat in the metallic resistor furnace varies from about 20% at 500°F to about 3% at 1600°F. Hence in the electric metallic resistor furnace the reheating of glass at temps. required for molding is secured almost entirely by radiant heat, and the temp. is under perfect control. J. B. P. (*C. A.*)

34. The heat balance of glass leers. G. Gianoli. *Ind. laterizi ed aff.*, **1**, 16–8 (1922); *Chimie et industrie*, **9**, 115(1923).—G. counts on the following losses: producing steam required by the gas producer 3–3.2%; in gas producer (unburnt fuel in ashes, soot, radiation) 1.2–15%; cooling of the gases in the ducts 4–4.1%; regenerating chambers 6.1–6.7%; conduction and radiation from the leer 43–44.9%; flue gases 19%. There remains but 12.5–13.7% for the fusion of the glass. A. P.-C. (*C. A.*)

35. Resistivity of vitreous materials. L. L. Holladay. *J. Franklin Inst.*, **195**, 229–35(1923).—A study of the resistivity of hard, light flint, and lime glasses. J. S. H. (*C. A.*)

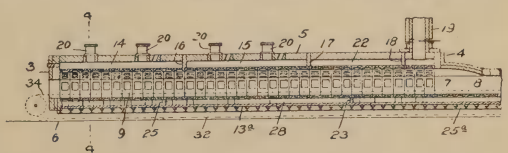
36. Opportunity for an American glass training school. Wm. M. Clark. *Glass Ind.*, **4**, 9(1923).—A discussion of the Glass Trade School in Zwiesel, Bavaria. Cf. *C. A.*, **5**, 1327. J. B. P. (*C. A.*)

PATENTS

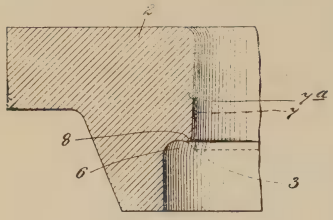
37. Apparatus for cutting sheet glass. Clifford A. Rowley and Joseph A. Reece. U. S. 1,453,856. In combination with a conveyor for carrying a sheet of glass longitudinally, an automatic apparatus for transversely cutting the glass sheet, comprising a cutting tool, a carrier for the tool, means for drawing the tool across the sheet, means for moving the carrier with the sheet while the cutter is operating, and means for returning the parts to the starting position.

38. Glass-cutting mechanism. Enoch T. Ferngren and Leonard D. Soubier. U. S. 1,453,315. The combination of a container for molten glass having an outlet orifice in the bottom thereof through which the glass issues, cutting mechanism comprising shear blades located beneath said orifice at opposite sides of the issuing glass, and means to advance said blades in spiral paths and thereby sever the issuing glass, said blades having V-shaped cutting edges, the outer portions of which overlap as the blades approach so that the cutting edges surround the issuing glass during the cutting operation.

39. Annealing furnace or leer. Walter O. Amsler. U. S. 1,453,116. In an annealing furnace or leer, an annealing chamber, a tunnel in communication with the annealing chamber, a chimney disposed between the annealing chamber and tunnel, and longitudinally extending heating flues disposed below the annealing chamber and extending beyond the chimney



and into the tunnel structure and exteriorly of the tunnel, said flues having connections with the chimney and arranged to produce a flow of gases from the tunnel back to the chimney. Cf. *Ceram. Abs.*, **2** [5], 96(1923).

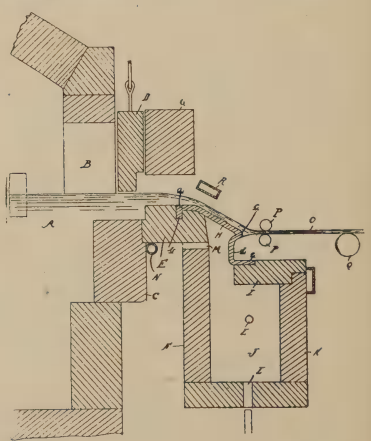


40. Method of manufacturing ring molds and the like. Peter Kucera. U. S. 1,453,278. The method of manufacturing molds for pressed glassware which comprises producing a matrix of approximately the desired shape, then subjecting portions of the mold to compression forces to compact and harden the said portions, then finishing the hardened portions to the desired size and shape.

41. Apparatus for gathering and transferring molten glass. John F. Rule. U. S. 1,453,285. Cf. *Ceram. Abs.*, **1** [11], 290(1922). The combination of a carrier rotatable continuously about a vertical axis, a gob forming receptacle carried thereby open at its lower end to receive a charge of glass, means to dip said receptacle into contact with a pool of molten glass during said rotation and gather a charge of glass by suction, a knife on said carrier, means to project the knife across the bottom of the receptacle to sever the gathered glass from the supply, a burner on said carrier, means to project the burner laterally to an operative position directly beneath the charge of glass and direct a heating flame vertically upward against the cut end of the glass, means to then withdraw the burner, and means to introduce the glass into a shaping mold.

42. Matrix device for molds. Peter Kucera. U. S. 1,453,277. A block mold for the manufacture of glassware or the like comprising in combination a body portion provided with a mold recess, a mold table, a ring mold, a member mounted upon the side wall of the mold and being provided on one end with a configuration adapted to be impressed upon the article being molded and means operated by the ring mold to move said member into operative position and operated by the mold table to move said member out of engagement with the finished molded article.

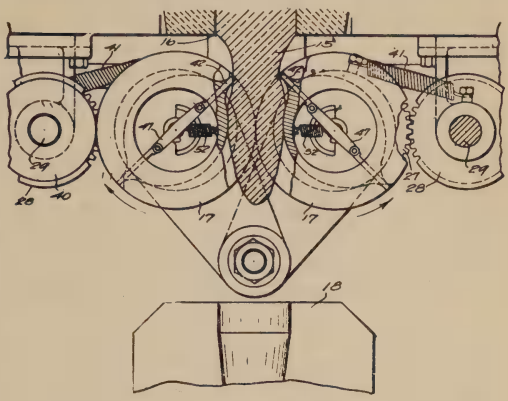
43. Apparatus for drawing sheet glass. William J. Jacobs. U. S. 1,453,842. In a sheet glass drawing apparatus, the combination with a means for supplying molten glass continuously, of a metallic slab onto which the glass from the supply is adapted to flow in a continuous sheet, means for cooling the glass while on the slab, and means for stretching it from the edge of the slab into a sheet of predetermined thickness.



44. Method of and means for feeding molten glass. Leonard D. Soubier. U. S. 1,453,290. The combination of a container for molten glass having an outlet at which a continuous supply of the glass is maintained and through which a column of glass is extruded, a pair of gob shaping rolls on opposite sides of the glass, means to rotate said rolls in contact with the extruded glass while the latter is still united with the glass in the container, and cutting mechanism arranged to advance with the shaping surfaces of the rolls and sever the glass into individual masses.

The combination of a gob forming roll having two oppositely disposed gob forming

recesses extending along its periphery, said roll having diametrically opposite slots between the ends of said recesses, cutter blades mounted to reciprocate radially in said slots, a yoke connecting said blades, means to rotate the roll, and a stationary cam arranged to shift said yoke in one direction when the roll reaches a predetermined point in its rotation to thereby project one cutter and to shift the yoke in a reverse direction when the roll has rotated a half revolution beyond said position, whereby each cutter is projected at the same rotative position. Cf. *Ceram. Abs.*, **2** [4], 74(1923).



45. Glass. E. C. Sullivan and W. C. Taylor. Can. 228,865, Feb. 20, 1923. A glass has a combined silica and alkali percentage compn. over 90 and a mol. ratio of alkali to silica between 26 and 29 to 100 and a mol. ratio of bivalent oxides to silica between 7 and 10 to 100. Cf. *Ceram. Abs.*, **2** [3], 64(1923). (*C. A.*)

46. Glass. W. C. Taylor. Can. 228,866, Feb. 20, 1923. A glass with a low sp. gr. contains at least 3% B_2O_3 and a sulfate salt. Cf. *Ceram. Abs.*, **2** [6], 126(1923). (*C. A.*)

47. Apparatus for bending continuous-sheet glass. J. P. Crowley and C. A. Rowley. U. S. 1,447,647, Mar. 6. Cf. *Ceram. Abs.*, **1** [12], 332(1922). (*C. A.*)

48. Leer conveyer for continuous-sheet glass. F. E. Deulin. U. S. 1,447,648, Mar. 6. (*C. A.*)

49. Leer conveyer for continuous-sheet glass. H. S. Deputy. U. S. 1,447,649, Mar. 6. (*C. A.*)

50. Apparatus and method for drawing two sheets of glass in separable contact with each other. A. E. Fowle. U. S. 1,447,654, Mar. 6. (*C. A.*)

51. Apparatus and method for flattening sheet glass. S. B. Henshaw. U. S. 1,447,661, Mar. 6. (*C. A.*)

52. Drawing sheet glass. J. Whittemore. U. S. 1,447,702, Mar. 6. Mech. features. (*C. A.*)

53. Muffle leer furnace adapted for annealing glass. C. L. Sharp. U. S. 1,447,633, Mar. 6. (*C. A.*)

54. Glass. General Electric Co. Brit. 188,451, Sept. 14, 1921. Transparent SiO_2 glass is made by fusing SiO_2 in a vacuum and then compressing the fused mass while plastic to reduce enclosed bubbles. A suitable construction is specified. (*C. A.*)

55. Glass. Corning Glass Works. Brit. 189,126, Nov. 14, 1922. A part of an app. for molding glass is made from steel contg. Cr 10–15 and Co 0.5–5%. Another suitable steel contains approx. Cr 13, Mn 0.5, Co 0.6, and C 0.35%. Another steel contains Cr and about 4% of Si. Molds made from these steels have a longer life than molds made from cast Fe, and they are particularly suitable for use with a glass that requires to be worked at a high temp. (*C. A.*)

56. Glass. Tôsaku Yoshioka. Japan. 40,242, Oct. 6, 1921. When superheated steam is passed into a mixt. of silicates and NaCl heated below its m. p., the reaction

$2NaCl + SiO_2 + H_2O = Na_2SiO_3 + 2HCl$ takes place. The silicate is then melted with suitable materials for glass. *E. g.*, a mixt. of SiO_2 100, CaO 22 and NaCl 33 is heated at 700° in a rotating fur., into which superheated steam is then passed; a porous mass of silicate is smoothly produced. (*C. A.*)

Heavy Clay Products

57. Brick specifications. ANON. *Tonind. Ztg.*, **47**, 212(1923).—Building brick are burned brick made of loam, clay or clay like mass which may contain sand or grog. The test below shall be the average of at least 10 tests.

	Compression strength, kg./cm.^{2}
Clinker brick	350
Hard burned brick	250
Common brick 1 grade	150
Common brick 2 grade	100

The brick should be 25 cm. long, 12 cm. wide and 6.5 cm. high. The per cent absorption should be less than 5% for clinker and less than 8% for hard burned brick. Clinker, hard burned brick and common brick used for building purposes should be sufficiently resistant to frost. In this test 10 bricks are saturated with water and frozen at −4°C 4 hrs. This is repeated 25 times. In the compression test none of the clinker brick shall have compression strength less than 300 kg./cm.^{2} For hard burned brick none shall have a strength less than 200 kg./cm.^{2} Common brick of 1st grade should have no brick having less than 120 kg./cm.^{2} and those of the 2nd grade should have no brick having a greater strength than 90 kg./cm.^{2} H. G. S.

58. The use of waste slate for brick making. G. HERMANT. *Rev. Mat. Constr. Trav. Pub.*, **162**, 60–2(1923).—Waste slate, ground to pass an 8 mm. screen, mixed with 5–8% slaked lime, and moistened with 8% water, was made into brick in a brick press. The brick were then hardened by exposing them for 8 hrs. to steam at 8 kgms. pressure. The crushing strength of the brick was 120 kgms. per sq. cm. Of a series of mixts., varying the size of particles, and the per cent of slaked lime used, the above mixt. gave the max. strength. The slate analyzed in %, SiO_2 57.2, Al_2O_3 26.0, CaO 3.30, MgO 3.00, ign. loss 3.10. L. N.

59. The treatment of calcareous clays. P. C. *Rev. Mat. Constr. Trav. Pub.*, **162**, 41B–43B(1923).—Review mainly of the work of BINNS, COATS, AND BLEININGER, and description of the Pratt machine for removing lime concretions from clay. L. N.

60. Equipment and methods used at Darlington Clay Products Co. (First Section.) C. FORREST TEFFT. *Brick and Clay Record*, **62**, 771–4(1923).—Description of brick machine, cutter, accounting for ware, drying, burning, fuel used, and fans. The plant is equipped with 8 round down-draft kilns with a total holding capacity of 580,000 brick. One of these kilns has just recently been built. The construction of this kiln is rather interesting as the kiln is carefully insulated throughout—in bottom, side walls and crown. The induced draft used in the kilns is furnished by two fans. One of these is located at the cold end or receiving end of the drier so that its suction draws the hot combustion gases from the kilns through brick flues and into cast-iron pipes located immediately underneath the drier tracks. The 2nd fan is located at the end of the main brick flue, which runs across the end of the drier and from which the first fan takes its hot gases for the drier. These two fans furnish the kilns with a constant, neverfailing draft *regardless of weather conditions.* The draft obtained is equivalent to a stack *300 ft. high heated all the time.* There is no difference with the draft system whether gas or coal for fuel is being used. The fan at the cold end of the drier is called the drier fan. It is a standard $5^1/_2'$ steel plate fan with $^3/_4$-steel housing, and is driven with a 20 h. p. motor

at 650 r. p. m. In reality only 18 h.p. is required to drive the fan. The temp. of the gases handled averages about 325°F and because of this the bearings on the fan are water cooled. The fact that the gases furnishing ht. for the driers are confined within pipes, is of course, positive protection against impurities coming in contact with the brick, as is the case with a waste heat drying system, where the gases from cooling kilns are traveling in the same chamber that contains the brick. This fact makes it necessary to bring in outside air into the drier to act as a carrying agent for the moist. coming from the brick. A steel housing fitted to the discharge end of the drier fan carries the hot gases to a 50 ft. stack immediately over the cold end of the drier. The stack being heated with these gases produces a suction or a draft at its base and, by means of opening dampers leading from the top of each tunnel an outlet is obtained for the moist. laden air from the brick. A 2nd fan called the kiln fan is located at the end of a large flue. The duty of this fan is to handle all the combustion gases that do not need to go through the drier. This is a number 12 multivane fan and actually requires between 15 and 20 h.p. to pull it. The fan runs at 450 r. p. m. and is equipped with water cooled bearings as the gases sometimes reach a temp. of 600°F. Plans are given of kiln bottom, drier and cross section of drier from end to end. This is to be supplemented by a 3rd section dealing with description of control equipment, method of setting, cooling, drawing, stocking, and details of the burners. J. W. H.

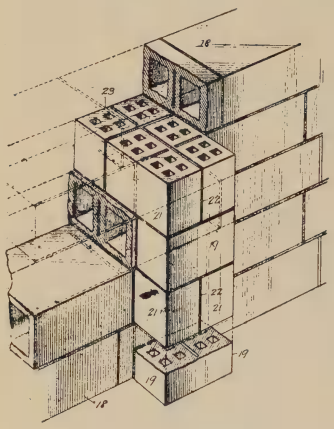
61. Equipment and methods used at Darlington Clay Products Co. C. Forrest Tefft. *Brick and Clay Record*, **62**, 681–4(1923).—Description, accompanied by photos and sketch of operns. used in the manuf. of bricks at Darlington, Pa. plant of Fiske and Co., Inc. Detailed information is given relative to mine, clay drilling, blasting, drainage, ventilation, roof supports, supervision, haulage, handling of clay, clay storage, grinding, screening, ground clay storage, and mixing of clay with manganese. This article to be followed with another section devoted to drying and burning problems. J. W. H.

62. Manufacture of clay products in Germany. Gustav Benfey. *Brick and Clay Record*, **62**, 602–3(1923).—One of a series of articles treating with the manuf. of clay products in Ger. Pick and shovel methods cannot be discarded in small pits where foreign materials such as lime, hard stones, etc., must be removed. Where such conditions do not exist a Liebscher dredger is used. This machine is of same general type as shale planer. Clay feeders of round and box type are used: the round feeder to feed material evenly while the box type feeder performs additional service of mixing clays with other ingredients. Sketches and photos of planer and feeders are given. J. W. H.

63. A new way to use the shale planer. Anon. *Brick and Clay Record*, **62**, 788–9 (1923).—A conveyor used in conjunction with shale planer permits working of face worthy of note. Photos and diagram are given. Advantages claimed are: (1) It keeps a smaller amt. of face open for wet and cold or exceedingly dry weather. (2) It increases the capacity of the machine over that which can be obtained with the same machine going straight into the bank for the tapering out from a full cut to no cut is almost instant on one end of the swing, while on the other it is the same as ordinarily experienced. This raises the efficiency of the Adel excavator working on a 25′ radius from 94% to slightly more than 96%. By this efficiency is meant that percentage of the cutting time at which the machine is cutting the full depth or full capacity. It should be clearly brought out that any machine which does not increase the radius of swing from one cut to the next will cut its full efficiency or capacity for one instant only and that is when the cut is directly ahead of the direction in which the machine is going. (3) The face of the bank which is left behind the planer and which in the ordinary plant will be cut over in about 60 d. is left circular so that it does not cave in or weather down easily. (4) The depth of the cut in the floor of the pit can be regulated so that

within two movements of the loading hopper, the machine can dig itself in easily 15 ft. if necessary. In starting in on a new cut this is sometimes quite an advantage. J. W. H.

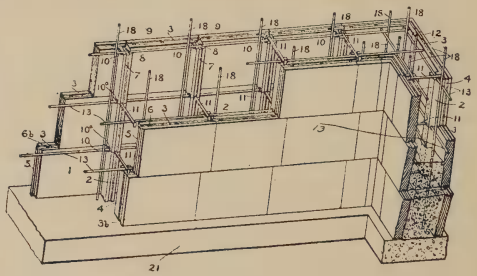
64. Automatic kiln firebox. STAFF ARTICLE. *Brick and Clay Record*, **62,** 614 (1923).—Description and sketch of system used by P. J. LAUBSCHER of Fredericksburg, O., used for feeding a small quantity of coal continuously. J. W. H.



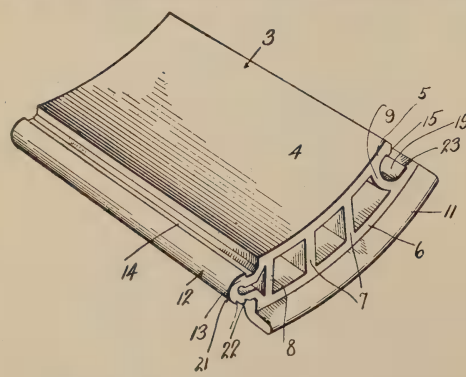
PATENTS

65. Pilaster construction. FREDERICK HEATH. U. S. 1,453,837. A pilaster construction, comprising wall blocks arranged in interbonding relation in superposed courses, the width of each pilaster block being slightly less than one-half its length, one of said courses including a pilaster block disposed parallel with and entirely outside of the wall face and the next superposed course including a pilaster block disposed at right angles to and overlapping said subjacent block and also overlapping a wall block within the wall body to securely bond the wall and pilaster together.

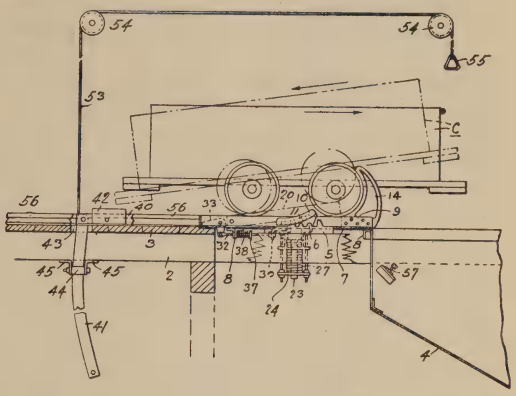
66. Masonry structure. WILLIAM F. WAGNER. U. S. 1,453,557. In a masonry structure, two series of blocks arranged apart so as to leave a space between them, the blocks of each series being provided with inner retaining supports and with sockets on their upper surfaces, in combination with aligning rods engaging the retaining supports and each spanning a number of said blocks, and transverse tie bars, each engaging the sockets of opposite blocks with its ends.



67. Building block. NELS A. NORD. U. S. 1,453,806. A building block comprising a body provided at one edge with a tongue portion which is curved along the plane of its axis beyond the adjacent edge face of the body, said tongue portion being provided at one side with a recess and at its opposite side with V-shaped grooves, the body of the block being provided at its opposite edge with a substantially U-shaped socket the mouth of which is of the same transverse breadth as the transverse breadth of the tongue portion at its base line, the intermediate portion of the socket being of greater transverse breadth than the intermediate and end portions of the tongue, the socket being of greater depth than the length of the tongue, the mouth portion of the socket being provided at one side with an inwardly disposed flange adapted to fit snugly in the recess upon the tongue of an adjacent block, the relative dimensions of the tongue portion and the socket being



such that when two of the blocks are placed edge to edge together the tongue portion of one block is completely received in the socket of the other block, with the face surfaces of the adjacent blocks in close contact with each other and sufficient space being left between one side of the tongue portion only and the adjacent surface of the socket to receive and completely enclose a filling of cement.



68. Kickback car dump. CHRISTIAN B. ANFINDSEN. U. S. 1,453,331. Cardumping apparatus of the kick-back type comprising a support, tracks carried by the said support, means for causing the said support to be tilted to cardumping position, auxiliary tracks also carried by the said support and means for resiliently maintaining the said auxiliary tracks inclined upwardly in the direction of movement of the cars coming upon the said support.

BOOK

69. Manual of Face Brick Construction. J. H. BLACK. Milwaukee, Wis.: C. N. Caspar. 116 pp. $9. (*C. A.*)

Refractories

70. On the thermal properties of refractories at high temperatures. YOSHIAKI TADOKORO. *Rept. of the Research Lab. of the Imperial Iron Works*, **2**, 41 pp.(1922).—*I. Refractory materials. II. Classification.* Raw materials, propns. and methods of mfg. various fire bricks at the brick plant of the Imp. Iron Works in Yawata are described. *III. Properties required in refractory materials* and their measurement at high temp. *IV. App. for measuring coeff. of exp. and its manipulation.* At one end of cylindrical test piece, 30 mm. in diam. and 180 mm. long, 4 small round holes, 5 mm. in diam., and 30, 80, 130 and 80 mm. deep, were bored symmetrically to its axis, and 3 quartz tubes and a thermo-element were inserted in them. The other end of the test piece was fixed by a quartz tube. It was heated in an elec. fur. with 2 platinum coils. Its expansion was calculated from the rotation of 3 mirrors attached to the ends of the quartz tubes. *V. Results of the expts.* (1) Linear change of raw silica brick in heating. (*A*) *First heating and cooling.* Exptg. with a dry raw silica brick, composed of 78.4% Tamba quartzite, 19.6% Usuki quartzite and 2.0% CaO, the following result was obtained: (*a*) The test piece expanded about 1.35%, when it was heated to 575° C. Then the expansion stopped abruptly owing to the transition of α quartz to β. (*b*) No change in length was observed up to 870° where a slight contraction, about 0.05%, corresponding to the transition of α tridymite to β_2, took place. (*c*) No remarkable change occurred between 870°–1130°; at the latter temp., sudden expansion occurred; it may owe to the acceleration of the transition of β quartz to β cristobalite at 1250° by the impurities. The expansion between 575° or 1130° and 1300°, amounting to 0.85% of original length, was irreversible. (*d*) Cooling curve shows no linear change between 1300–570°. It began to descend suddenly at 570°, leaving 0.98% expansion at ordinary temp. Besides, the heating and cooling curve shows some changes at 200–300°C.

(*B*) *Second heating and cooling.* The same test piece was heated once more to 1300° and cooled. The reversible parts of the curve were similar to the former. As for the irreversible change, it was slight and no permanent expansion was caused by the treatment. (*C*) *Third heating and cooling.* The inclination of the obtained curve was similar to that of the expt. *B*. (2) Heating and cooling curves of silica bricks. Burned bricks made of quartzite of Darien showed permissible permanent expansions only in 3rd or 4th heating to 1300°, while those made of red-and-white piebald quartzite, as used in the expt. 1, indicated no permanent expansion in the 1st treatment. (3) Irreversible expansion of a red quartzite. A red quartzite, contg. 94.26 SiO_2, 2.10 Al_2O_3, 1.40 Fe_2O_3 and 0.84 CaO, was heated at various temps. to find changes in wt. and permanent expansion. The result seems to comply with that of the expt. 1. (4) Coeff. of expansion of various bricks. The following table shows the coefficients of 5 kinds of bricks:

	Magnesia brick	Silica brick	Chrome brick	Grog brick	Red brick
Mean coeff. of expansion (20–1000°)	1.255×10^{-5}	1.142×10^{-5}	0.902×10^{-5}	0.760×10^{-5}	0.700×10^{-5}

Calculated expansions of a by-product coke oven and a blast fur., assuming their mean temp. as 1000°, agreed pretty well with facts. (5) Expansion curve of coal. Test piece made of 2 mm. grains of Futase coal and 10% water shrunk about 2.5% at 300–400°. (6) Expansion of slag brick and slag cement. 11 curves are given. (7) Expts. on Manchurian magnesites. Chem. compns. of the samples were as follows:

Color	SiO_2	Fe_2O_3	Al_2O_3	$CaCO_3$	$MgCO_3$
Blue	20.02	0.48	0.14	0.90	79.03
White	16.62	0.72	0.32	0.60	81.42

(*A*) *Dissociation at ordinary pressure.* The dissociation began at 400°, was most vigorous at 600° and was nearly completed at 800°. (*B*) *Irreversible changes in length, sp. gr. and wt.* Each test piece was a cylinder, 30 mm. in diam. and 30 mm. long, cut from one of the said ores, and was heated in an elec. carbon-resistance fur. for $^1/_2$, 1 or 2 hrs. at constant temp. White magnesite showed max. expansion of 0.6% at 600°, contracted to original length at 800° and shrunk 4% at 1400°. Blue sample expanded 0.2% at 600°, shrunk to original length at 800° and contracted 3% at 1300°. Abrupt contraction occurred at the last temp., indicating their incipient fusion at 1300° or 1400°C. The loss in wt. occurred almost entirely at 400–800°. Sp. gr. was 3.0 for 100–600°, 1.6 for 800–1400° (800–1300° for the blue magnesite) and 2.5 for 1400–1700°. (*C*) *Slaking test.* The results of slaking tests in atmosphere or boiling water indicated that the Manchurian magnesites must be burned at least to 1300° or 1400°. (*D*) *Expansion and contraction of magnesite at high temps.* The white magnesite expanded with temp. until 600° was reached where its expansion amounted to 1.4%. Beyond 600°, slight contraction began. It shrunk rapidly at 1100°C. The cooling curve is almost straight. *VI. Tech. position of refractories.* Short discussion is given on the subject. Cf. *Ceram. Abs.*, **1** [8], 208(1922). S. KONDO

71. A new commercial refractory. ANON. *Chem. Age* (London), **8**, 419.—Elec. sintered magnesite, a material having the highest m. p. of any commercial refractory is now being produced in quantity by the Carborundum Co., Niagara Falls, N. Y. It is made from carefully selected cal. magnesite and is thoroughly fused in an elec. fur. It contains about 95% MgO and less than 1% of iron oxide, and has a m. p. of about 2600°C. The material is especially resistant at high temp. to iron or iron oxide. This makes it most valuable for lining metallurgical fur., either in the form of bricks or in

granular form, tamped in. A further unusual feature of elec. sintered magnesite is that it does not contract when subjected to conditions encountered in industrial installations. O. P. R. O.

72. Refractory materials. H. Drouot. *La Tech. Moderne*, **15**, Jan.-Mar.(1923).—Les Materiaux Refractaires gives a comprehensive summary of refractive materials, including a history of the refractory industry; procedure in fabrication of refractory materials; general properties of refractories; their analyses, chemistry, metallurgy and fusion point, compn. of crucibles for fusion of metals; diagrams showing the high temp. to which refractories may be subjected, which temp. is the detg. factor of their industrial application. The article is well illustd. with cuts and descriptions of machinery used in the refractory industry, including gyratory crusher, mixing, kneading, briquetting and molding machines. Much remains to be done in this industry with regard to the quality as well as the price of products, and a no. of problems have been but indifferently solved in the chem. and metallurgical industries. It is hoped that the engineer of tomorrow will have at his disposal, for high temp. work, materials of low cost, with high resistance and not easily affected by quick changes of temp., chemically neutral, not easily attacked by gas and dust in suspension, and which have a sufficiently high point of softening to allow performing other contemplated reactions. O. P. R. O.

73. Some properties of graphite. R. M. Burns and G. A. Hulett. *J. Am. Chem. Soc.*, **45**, 572–8(1923).—The ds. of various graphites were detd. by the liquid immersion method. The d. of pure graphite is about 2.20, and that of Acheson graphite about 2.30. The d. of C produced by the explosion of graphitic acid indicates that it is probably graphite. Completion of the "drift" or increase in wt. during immersion in the liquid was hastened by pressure, and the tendency to drift was largely destroyed by compression by the detn. of d. H. J. C. (*C. A.*)

74. Electric brass furnace practice. H. W. Gillett and E. L. Mack. Bur. Mines, *Bull.* **202**, 319 pp.(1922); cf. *C. A.*, **14**, 1784, 2133, 2753, 3195.—A report too comprehensive to permit abstracting. Numerous tables, illustrations, and both subject and name indexes are included. The purpose of the report is to present available information on what com. elec. brass furnaces are doing and can do, and to show, by description and exptl. test data, the evolution of present furnace types, including information on failures as well as on successes. Fundamental principles of design, construction, and operation are also considered. After a discussion of theoretical and practical advantages of elec. brass melting, of the distinction between steel-melting and brass-melting elec. furnaces, and the classification of elec. brass furnaces, the individual furnaces are considered under the following classes: (*a*) crucible furnaces, either lift-out or tilting; (*b*) hearth furnaces heated by a resistor, a smothered arc, a direct arc, or an indirect arc, the last two types in both stationary and moving furnaces, or by induction in a horizontal ring, a vertical ring, or a high frequency furnace. In conclusion are considered the factors governing the choice of a particular furnace, the relation of the central station, the cost of power, methods of testing furnaces, and the conservation possible in metals, crucibles, labor and health, and fuels. L. J. (*C. A.*)

75. Smelting silica bricks with reverberatory slags in a copper blast furnace. R. F. Wood. *Eng. Mining J.-Press*, **115**, 404–7(1923).—Unusual changes were sometimes necessary during the World War. As a result Cu-impregnated SiO_2 brick and reverberatory slag, for instance, were both used. Either of these materials would be undesirable if used alone. It was found possible, however, by proper combinations to use them together. While there was a tendency toward formation of salamanders, even with unusual precautions, the practice was so developed as to get very satisfactory results, considering the unusual and difficult materials. W. discusses development of these changes in practice. H. C. P. (*C. A.*)

PATENTS

76. Ceramic ware and method of making the same. CHARLES W. SAXE. U. S. 1,454,000. A ceramic article consisting of an impervious portion of porcelain integrally united by vitrification with a porous portion of crystalline alumina granules bonded by vitreous clay material.

77. Process for making refractory products. LOUIS P. KRAUS, JR. U. S. 1,453,468. The method of treating refractory material consisting in roasting a ground mixture of the material and a combustible at such a clinkering temperature below its melting point as to produce a clinkered material in the form of spongy grains free from crystalline structure.

78. Graphite crucible. HIROSUKE NAKAMURA, KOZO NAKAMURA and HIKOSHIMA RUTSUBO KABUSHIKI KAISHA. Japan. 40,310, Oct. 18, 1921. The wall of the crucible forms V-shaped layers; it is manufd. by the machine described in 39,334. Owing to the special construction of the wall, it is resistant to changes of temp. and is very durable. (*C. A.*)

79. Brick. G. TUMURA. U. S. 1,446,238, Feb. 20. Crushed grains of liparite 1 and clay 3 parts are used together to form a brick which is light and fire-resistant. (*C. A.*)

BOOK

80. Manufacture and Uses of Abrasive Materials. ALFRED B. SEARLE. London: Pitman. 127 pp. 2s. 6d. (*C. A.*)

Whiteware

81. Comparative examination of the structure of Japanese and foreign porcelains. R. SHIGEMUNE. *Tokio Industrial Lab. Rept.*, **27** [6], 59 pp.(1922).—Microstructure of 33 Jap. and 24 foreign porcelains, mostly table wares, has been examined. *1. Porosity of the body.* The max. and min. sizes of pores in each section are given. There are 2 kinds of pores. One of them which seems to have been produced in forming, is large and has indefinite shape. It is frequently long and slender along the surface of the body. Sometimes it is developed at right angles to the surface with round sections. The other kind of pore which seems to have been produced by the evoln. of water-vapor and gases is round and usually small. *2. Size of grains.* The max. and min. sizes of quartz grains in each section are shown in a table. *3. Appearance of ingredients.* The state of melting of quartz grains is described for each thin section. *4. Formation of sillimanite, and translucency of body.* The translucency of body depends on the degree of mutual melting of raw materials, amount of ferric oxide, d. in black spots produced by massing of iron due to the melting of biotite and other ferruginous minerals, and formation of sillimanite. Descriptions on sillimanite, black spot and biotite are given for each thin section. The thin sections may be classified by the degree of sillimanite-formation in (*a*) sections showing no sillimanite, (*b*) those in which some of feldspar grains are replaced by masses of fibrous minute crystals, (*c*) sections whose feldspar has been sillimanitized almost entirely and (*d*) sections whose ground mass contains fibrous minute crystals. Black spots are usually round, measure mostly 0.001–0.2 mm. and are only opaque body in the thin sections. The result of burning a body for cone 9, composed of Katogun kaolin 35%, Hakuhoto quartz 23%, Omishima feldspar 35%, and Tokiguchi kaolin 7%, to cones 9, 12 and 15 indicates that black spots grow in size but diminish in number, as the burning temp. rises. *5. Jap. porcelains.* Jap. porcelains may be classified in 2 groups. (*a*) Porcelain made of plastic clay, feldspar and weathered granite. Thin sections are usually light brown and have sillimanite in their groundmass. (*b*) Porcelain mainly made of decomposed acid rock. Porcelain which has been

mainly made of weathered liparite has no sillimanite in ground mass, though its feldspar grains are rarely sillimanitized. It is generally fine-grained and is light gray or white. The microstructure of Kutani wares which are made of Hanasaka rock (weathered quartz-porphyry) 5–6, Gokokuji rock (weathered quartz-porphyry) 4–5 and Nabetani clay 3–6, resembles that of porcelain (*a*). *6. Comparison of Jap. and European porcelains.* (*1*) *Pores.* Pores in the European porcelains are generally less and smaller than those in Jap. wares. (*2*) *Size of quartz grains.* Generally speaking, quartz grains in the European wares are smaller than those in Jap. porcelains. (*3*) *Appearance of quartz grains.* Quartz grains in the European wares have classified outline, while only a few Jap. porcelains show similar structure. (*4*) *Formation of sillimanite.* The European porcelains are generally superior to the Jap. in this respect. (*5*) *Translucency.* Jap. porcelains are generally superior to European in translucency. 39 microphotographs are given. S. KONDO

82. Experiments on the manufacture of pure-white hard porcelain. MIKIYA AKATSUKA. *Rept. of the Pottery Lab.* (Kioto), **1,** 1–13(1922).—Many expts. were done with the purpose of producing pure-white porcelain with Korean kaolin as its chief raw material. The firing temp. was cone 14 all through the study. *1. Raw materials.* Korean kaolin of Daiyamen, Katogun, Keishonando, Gairome clay (highly plastic kaolin) of Tokiguchi, feldspar and quartz of Ehime prefecture, and talc of S. Manchuria were used. The Korean kaolin gave the following analyses: 45.06 silica, 38.44 alumina, 0.54 ferric oxide, 0.73 lime, 0.16 magnesia, 0.80 alkalies and 14.32 loss on ignition. *2. Compn. of body.* Its range was clay 54–67% (kaolin 33–53%, Gairome clay 6–21%), feldspar 21–29% and quartz 12–18%. These materials were used in air dry state. The content of moist. was as follows: kaolin 6.64%, Gairome clay 6.32%, feldspar 0.20%, quartz 0.08% and talc 0.08%. *3. Glaze formula.* Glazes tried were $\left.\begin{matrix}0.65\ K_2O\\0.35\ MgO\end{matrix}\right\}$ 75–0.90 Al_2O_3.9.5–10.0 SiO_2, $\left.\begin{matrix}0.70\ K_2O\\0.30\ MgO\end{matrix}\right\}$ 0.8–1.2 Al_2O_3.9.0–12.0 SiO_2, $\left.\begin{matrix}0.75\ K_2O\\0.25\ MgO\end{matrix}\right\}$ 1.0 Al_2O_3.9.0 SiO_2 and $\left.\begin{matrix}0.80\ K_2O\\0.20\ MgO\end{matrix}\right\}$ 0.85–0.95 Al_2O_3.8.5 SiO_2. They were composed of feldspar, Gairome clay, talc and quartz. *4. Bending and shrinkage of bodies.* Descriptions are given of the expts. *5. Forming.* The ease of forming by hand wheel, pull-down and jigger, and casting were tested. 0.3% sodium carbonate was added to the casting slips. *6. Glazing.* Glaze slips rich in feldspar are liable to settling. Therefore, a small amt. of acetic acid (about 20–30 cc. for 72 l. cask) was added. Its effect is not temporary as that of ammonium carbonate. *7. Results.* (*a*) The suitable grinding time for bodies was 25 hrs. with 100 kg. wet grinding cylinder. It was 35 hrs. for glaze when the same grinding cylinder was used. Talc has to be ground for 20 hrs. before it is used in glaze batches. (*b*) The following bodies were excellent with respect to forming, cracking in drying and burning color:

Korean kaolin	Tokiguchi Gairome	Ehime feldspar	Ehime quartz
33	21	28	18
38	17	28	17
44	19	23	14

(*c*) Glazes of the formulae, $\left.\begin{matrix}0.65\ K_2O\\0.35\ MgO\end{matrix}\right\}$ 0.90 Al_2O_3.10.0 SiO_2, $\left.\begin{matrix}0.70\ K_2O\\0.30\ MgO\end{matrix}\right\}$ 0.90 Al_2O_3.10.0 SiO_2, $\left.\begin{matrix}0.70\ K_2O\\0.30\ MgO\end{matrix}\right\}$ 1.20 Al_2O_3.11.0 SiO_2 and $\left.\begin{matrix}0.70\ K_2O\\0.30\ MgO\end{matrix}\right\}$ 1.20 Al_2O_3.12.0 SiO_2 were satisfactory. The last glaze which was most excellent among them was improved further in color and luster by partly replacing the Gairome clay with the kaolin. The batch was as follows: Ehime feldspar 41.4, Tokiguchi Gairome 8.0, Korean kaolin 5.7, Manchurian

talc 4.0 and Ehime quartz 40.8. (*d*) Most of 27.4 cm. plates shrank to 24.6 cm., of which 0.1 cm. owed to glaze layers, in drying and burning. S. KONDO

83. Study of translucent hard-faience glaze. JISUI UYEDA. *Rept. of the Pottery Lab.* (Kioto), **1,** 14–56(1922).—*I. Purpose of the study.* Usual transparent hard-faience glaze exposes all defects on body just as they are. Moreover, it has an excessive luster like that of inferior glazes. On the other hand, porcelain has a fine appearance, since it is constructed of translucent body, glaze which is not fully transparent and a translucent intermediate layer. The purpose of the study was to produce a hard faience with an appearance of porcelain by improving the said properties of the glaze and also by coloring its body and glaze. *II. Single opacifiers.* (*a*) *Cryolite.* It has a tendency of producing devitrified spots. Otherwise, the result was nice. (*b*) *Fluorspar.* It acted like cryolite. The use of an engobe composed of 49.5% fluorspar, 41.3% feldspar and 9.2% Gairome clay under a transparent glaze is promising, though the uniform application of the engobe was not successful. (*c*) *Stannic oxide.* It makes the glaze matt or gives an appearance like an enamel. (*d*) *Antimony oxide.* It behaves like stannic oxide. (*e*) *Zirconia.* It acts like stannic oxide, but produces bluish shade instead of yellow with the latter. (*f*) *Zinc oxide.* Its action as opacifier is very weak. However, it makes the glaze white and bright. *III. Compound opacifiers.* (*a*) *Stannic oxide and fluorides.* Satisfactory results were first obtained with glazes containing 3% stannic oxide and 5% fluorspar or cryolite. Starting with the results, effects of variation in the amt. of stannic oxide, fluorine, alumina and silica were studied. Among numerous batches, the following proved to be the best for cone 01a:

$$\left.\begin{matrix}0.32\ PbO\\0.10\ K_2O\\0.20\ Na_2O\\0.38\ CaO\end{matrix}\right\}\ 0.30\ Al_2O_3\ \left\{\begin{matrix}3.60\ SiO_2\\0.40\ B_2O_3\\0.15\ F_2\\0.063\ SnO_2\end{matrix}\right.\qquad (a)$$

The batch was composed of 49.40% frit, 10.17% white lead, 11.17% Korean kaolin, 1.74% Gairome clay and 27.52% quartz. The formula of frit is

$$\left.\begin{matrix}0.191\ PbO\\0.119\ K_2O\\0.238\ Na_2O\\0.452\ CaO\end{matrix}\right\}\ 0.119\ Al_2O_3\ \left\{\begin{matrix}1.380\ SiO_2\\0.476\ B_2O_3\\0.178\ F_2\\0.075\ SnO_2\end{matrix}\right.$$

0.0475 ferric oxide and 0.00380 cobalt oxide were added to 100 frit batch. (*b*) *Stannic oxide and zinc oxide.* Excellent result was obtained with a glaze:

$$\left.\begin{matrix}0.32\ PbO\\0.10\ K_2O\\0.20\ Na_2O\\0.38\ CaO\end{matrix}\right\}\ 0.30\ Al_2O_3\ \left\{\begin{matrix}3.60\ SiO_2\\0.40\ B_2O_3,\\0.12\ ZnO\\0.063\ SnO_2\end{matrix}\right.$$

composed of 50.0% frit, 10.1% white lead, 11.0% Korean kaolin, 1.7% Gairome clay of Tokiguchi and 27.2% quartz for cone 01a–02a. The formula of frit was

$$\left.\begin{matrix}0.190\ PbO\\0.119\ K_2O\\0.238\ Na_2O\\0.453\ CaO\end{matrix}\right\}\ 0.119\ Al_2O_3\ \left\{\begin{matrix}1.370\ SiO_2\\0.476\ B_2O_3\\0.143\ ZnO\\0.075\ SnO_2\end{matrix}\right.$$

0.0450 ferric oxide and 0.0045 cobalt oxide were added to 100 frit batch. (*c*) *Zirconia and fluorspar.* By introducing 0.07 ZrO_2 instead of 0.063 SnO_2 in the formula (1),

a good glaze was obtained. However, it was deficient in luster, although this was later improved by increasing the amt. of fluorspar. (*d*) *Antimony oxide and fluorspar.* Only a few expts. were done with these opacifiers, as antimony oxide is said to be poisonous. (*e*) *Bone-ash and fluorides.* Expts. with bone-ash and cryolite or fluorspar gave pretty good results, though the glazes were far inferior in translucency, luster and color to those with stannic oxide and fluorspar. *V. Coloring hard faience.* (*a*) *Coloring body.* The use of $CoSO_4.7H_2O$ or $Co(NO_3)_2.6H_2O$ is described. An example of nice bodies is: 60.0% of liparite of Amakusa, 18.0% Gairome clay of Tokiguchi, 17.0% amalgatolite of Mitsuishi, 5.0% feldspar and 0.058% cryst. cobalt nitrate (0.015% cobalt oxide). The batch was ground wet for several hrs. in a grinding cylinder. Then 0.0712% cryst. sodium carbonate was added and ground again. (*b*) *Coloring glaze.* The usual way of adding cobalt oxide to frit is not satisfactory, as it produces a blue with purplish gray shade. Therefore various mixts. were tried. Barium chromate gave greenish blue of porcelain glazes. For glazes contg. stannic oxide the use of a mixt. of cobalt oxide and ferric oxide in amts. of 0.0025–0.003% and 0.025–0.03%, respectively, in matured glazes is recommended. S. KONDO

PATENT

84. Sagger. ITSURO KASUGAI. Japan, 42,575 May 12, 1922. Holes are bored at the sides and bottom of a sagger with the purpose of saving fuel in the glost-firing of porcelain. S. KONDO

Equipment and Apparatus

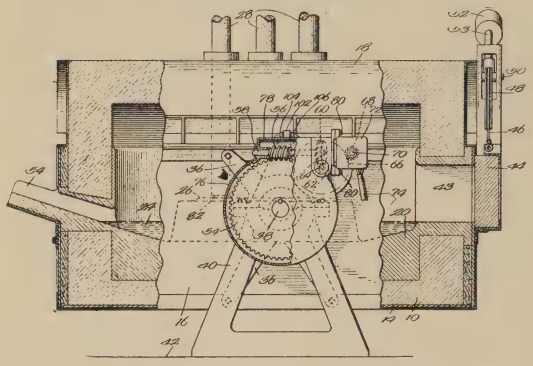
85. Compressibility of matter. Method and apparatus (patented) for measuring pressure exerted in a press. F. BONNET. *Rev. Mat. Constr. Trav. Pub.*, **162,** 58–60 (1923).—In compressing material, it is often necessary to know the pressure that is exerted in different parts of the press. For this purpose a modification of the Brinell method for hardness testing is applied. The device consists of a hard metal base plate, 5 cm. in diameter, that fits into a hollow hard metal cylinder. The base plate holds the metal sheath that is to register the pressure by indentation. The top of the hollowed cylinder is evenly bored out in three places, symmetrically located about its center, to keep in place 3 hard metal balls, each 1 cm. in diameter. These devices are then placed horizontally in different parts of the mass of material in the press, and then compressed. The pressure is evenly distributed over the surface of the device, the imprint on the metal sheath under each ball registering $^1/_3$ of the total pressure. The device is calibrated by plotting impression diameters against known pressures (*i. e.*, by weights). L. N.

86. Apparatus for photomicrography. G. DURANTE. *Compt. rend.*, **175,** 1201–3 (1922).—The app. described differs from the customary app. in that the source and microscope are hermetically sealed so that light cannot pass except through the ocular. A lamp with V-shaped filament gives a point source, all posterior rays being reflected by means of a spherical mirror. A rheostat affords adjustment for 3 different light intensities. Mirror, lamp, and condenser are enclosed in a jointed tube. The camera has the form and dimensions of a microscope case, through the top of which passes the ocular tube. The plate holder can be moved up or down on a rigid tube which is screwed on to the case but is demountable. The app. is readily portable, simple in operation, reasonable in cost, and has no bellows to limit size of exposure; by simple alignment of the plate, a strong magnification with feeble objectives is possible. With but small magnification, an image can be obtained at a distance of 2 m., which is bright enough to be seen readily by a limited audience. T. F. B. (*C. A.*)

87. New form of melting-point apparatus. H. A. BELL. *Ind. Eng. Chem.*, **15,** 375(1923).—A modification of the Thiele app. E. J. C. (*C. A.*)

PATENT

88. Electric furnace. ALFRED W. GREGG. U. S. 1,453,347. A metal receiving furnace box provided with doors through which material may be placed at one end, a pouring spout at the other end, means for leading electric current into the furnace to effect melting of material placed therein, trunions extending from opposite sides of the furnace, intermediate of said spout and said doors, journal supports for the trunions, an electric motor mechanism supported by a trunion for rocking the furnace on the trunions and expansion permitting means on the support preventing rotation of the motor about the trunion axis.



Kilns, Furnaces, Fuels and Combustion

89. Tunnel kilns. K. DÜMMLER. *Deutch. Topf. Zieg. Ztg.*, **54**, 95–6(1923).—Considerable power is required to force cars through a continuous kiln. This may be reduced by using a pitch of 1 to 20 or at least 1 to 10 thus allowing gravity to assist in forcing the cars through the kiln. The objections to this method is that the cars are slightly tilted. This may be overcome by using 2 sets of tracks, one inside of the other. The back wheels of the car rest on the outer track whereas the lower and the front wheels rest on the inner track which are elevated thus allowing the cars to pass through absolutely horizontal. H. G. SCHURECHT

90. Problems of continuous kiln burning. MARK A. TAYLOR. *Brick and Clay Record*, **62**, 597–8(1923).—Burning in the Youngren type kiln is explained. Kiln has 18 chambers, fired with fuel oil. Chambers are 32 ft. long, $16^1/_2'$ wide and hold 40 to 50 T. drain tile or 70 to 80 T. of hollow ware. Ordinary firing period for a chamber is 36 hrs. with approx. 60 hrs. of preheating preceding. Attempt to obtain $^1/_2$ to $^3/_4$-inch shrinkage per hr. completing it in 12 hrs. Chamber is held at a finishing temp. of 1950°F for 3 hrs. Stack gases are below 200°F; draft is of major importance. Drain tile kilns are ordinarily set at 16″ draft while closer settings are given 0.02 to 0.04 inches more. Pyrometers, cones, trial pieces, water smoking thermometer and draft gages are considered important. Opinions of others desired. See *Ceram. Abs.*, **1** [11], 276(1922). J. W. H.

91. Automatic feeding of fuel in Hoffmann continuous kilns. F. DELORME. *Rev. Mat. Constr. Trav. Pub.*, **162**, 43B–47B(1923).—Review of a detailed acct. of the results obtained with a "Colomb" automatic feeding device, reported in *Chaleur et Industrie*, Jan., 1923. L. N.

92. Mechanical burning of brick and tile. H. COUËTOUX. *Rev. Mat. Constr. Trav. Pub.*, **162**, 48B–54B(1923).—Descriptions and plans of the Hirt patented machinery. L. N.

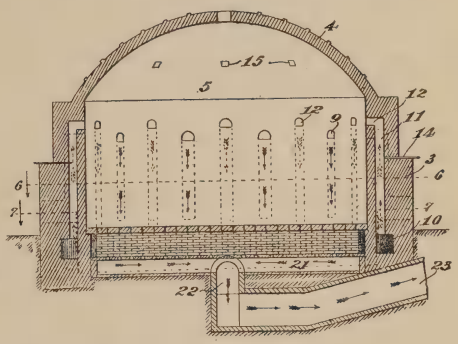
93. Methods of handling materials in the electric furnace and the best type of furnace to use. (Heat treatment.) F. W. BROOKS. *Trans. Am. Electrochem. Soc.*, **43** (Preprint).—A general discussion, with designs, of various types of elec. furnaces, such as, the plain box, the special box, the car, the recuperative and continuous types. Ad-

vantages and disadvantages of each and methods of handling the material to insure uniform temp. and high efficiencies are outlined. W. H. B. (*C. A.*)

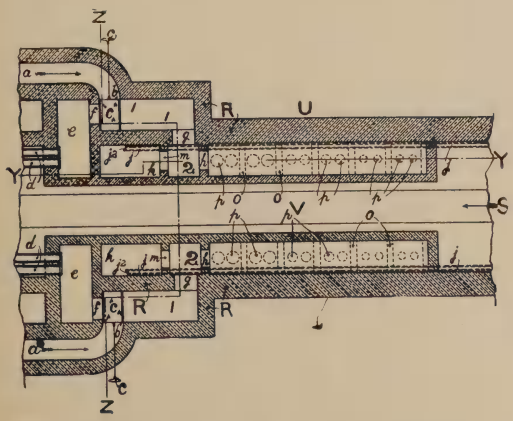
PATENTS

94. Improvement in kiln for burning brick and similar wares. TOKUSABURO SATO. Japan. 42,666, May 20, 1922. The kiln is provided with fire-boxes which have each a drop-arch and a channel-shaped wall at its rear. The drop-arch directs the flame produced on grate downward. The flame then strikes on the inverted-channel wall which is a kind of very low flash wall, situated much nearer to the grate than usual. The construction keeps the furnace-end hot and aids the complete combustion of gases. S. KONDO

95. Brick kiln. YASABURO SAITO. Japan. 42,989, June 30, 1922. This is a parallel ring kiln with 2 main flues between two burning channels instead of one as usual. Each main flue is connected with opposite burning channel by small flues which pass under the other. It has a drying chamber on the main flues. Another drying tunnel is constructed around the kiln. Pipes are imbedded in the kiln body over the crown. Hot air produced in them by conduction is utilized in drying bricks by connecting the pipes with the drying chamber and tunnel. S. KONDO

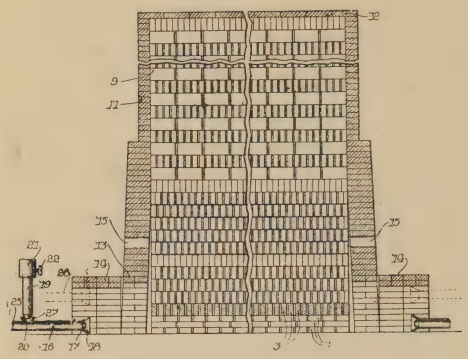


96. Kiln. ROBERT J. DYER. U. S. 1,452,638. A cylindrical kiln comprising a main wall having a smooth inner surface, a dome supported thereby, said main wall provided interiorly with a plurality of vertical flues each communicating at its upper end with the interior of the kiln, said wall being formed interiorly of its base with an annular duct with which the lower ends of alternate flues connect, said wall being further provided interiorly with a plurality of firepots opening at the exterior of the wall and one associated with alternate flues, and an outlet beneath said kiln connecting with said duct.



97. Gas-fired oven or kiln. JOHN HENRY MARLOW. U. S. 1,452,887. A tunnel oven or kiln provided on opposite sides with combustion chambers and air supply pipes, passages communicating with the combustion chambers, said passages decreasing in area towards the front of the oven or kiln, and a series of orifices which communicate with said passages. Cf. *Ceram. Abs.*, **1** [12], 301 (1922).

98. Method of and means for burning bricks. GRAFTON E. LUCE. U. S. 1,453,850. In a kiln, a stack of green bricks and a foundation of burned bricks, said foundation



of burned bricks having a furnace therein and said stack of green bricks having a furnace therein adjacent the furnace in the foundation, said furnaces being connected at intervals through a foraminous wall of burned bricks.

99. Gas producer. R. Daae. U. S. 1,445,300, Feb. 13. The pat. relates to a mechanism for supplying fuel to a producer through a feed opening in the cover. (*C. A.*)

100. Pure cresol from crude tar acids. I. H. Derby and W. Higburg. U. S. 1,445,668, Feb. 20. Crude-tar acids are treated with a small fraction of the chem. equiv. amt. of caustic alkali and after reaction the material is cooled, C_6H_6 or toluene is added and the material is extd. with H_2O_2 to sep. the alkali metal compds. (*C. A.*)

101. Removable-top continuous kiln. T. B. Moats. U. S. 1,447,682, Mar. 6. (*C. A.*)

Geology

102. Bauxite. Anon. *Keram. Rund.*, **31**, 105(1923); *Mines, Cavueres, Grandes Entreprises*, **3**, Jan., 1923.—Bauxites are partly products of disintegration of feldspar rocks, such as granite syenite and gneiss. U. S. is the principal source of bauxite, 90% of the U. S. bauxite comes from the Saline district of Arkansas. Here there is a 3.3 m. strata of bauxite which was derived from syenite. The next important source in U. S. is that in Ga. in Andersonville of the Sumter district. Bauxite found in Ga., Ala., and Tenn. are usually mixed with white clays. The U. S. bauxites have 15 to 33% combined H_2O and varying amts., of hygro. H_2O. In Ark. the freshly mined bauxite is passed through a rotary kiln in which it is heated to 600°C, thus reducing the hygro. H_2O to $^1/_2$ to 1%. The bauxite which is used for abrasives, and refractories is calcined in a rotary kiln so that it contains less than 1% combined H_2O. In 1919, 272,270 T. were used for Al, 67,842 T. for chem. purposes, 35,395 T. for abrasives and 1,074 T. for refractories. Bauxites of good quality also come from Brit. Guiana in S. Amer. In France a red variety is obtained in Herault and Bonche-du-Rhöne. The following data show the production of bauxite in different countries.

	1913	1917	1919	1920
U. S.	210,241	568,690	376,566	521, 308
France	304,323	118,973	160,820	186, 693
Dalmation-Istria	...	160,501	...	...
Italy	6,840	7,664	2,924	37, 360
Brit. Guiana	...	2,037	1,976	29, 390
England	6,055	14,724	9,221	...
India	1,184	1,363	1,682	...
Spain	...	...	1,751	...

The bauxite for Al must contain at least 52% Al_2O_3 and not more than 4% Si and 6.5% Fe_2O_3; for alum $Al_2(SO_3)_3$ the bauxite should contain at least 52% Al_2O_3 with a low content of Fe_2O_3 and TiO_2; for the production of refractories, it should contain a low content of Fe_2O_3. A new use for bauxite has been found in the production of a new cement. A mixt. of bauxite, coke and $CaCO_3$ is molten together. After cooling, the cement

is ground fine. This cement contains 50% CaO, 40% Al_2O_3 and 10% SiO_2. It is a very rapid setting cement and becomes harder after setting 24 hrs. than Port. cement after 28 days. It is resistant to sea waters. H. G. SCHURECHT

103. China clay (Cornwall, England). ANON. *Chem. Age*, **8**, 15(1923).—A fresh bed of fine china clay has been located at Cornwall: expts. have shown that it reaches to a depth of 60 ft.; and it is anticipated that there is an area of at least 20 A. O. P. R. O.

104. Sweden-stone quarries. ANON. *Swedish Yearbook*, p.129(1922).—The quarrying of various kinds of stone is of great industrial importance to Sweden; granite, marble, slate, sandstone, quartz, feldspar, and pot-stone are quarried. O. P. R. O.

105. Phosphates in Morocco. ANON. *Oil & Colour Trades Jour.*, **63**, 652(1923).—By the discovery of rich and vast phosphate beds, Morocco has become a potential factor of economic importance. These extensive beds of fine sand are phosphate of lime of a percentage varying from 68 to 78%. Estimates of their quantity vary from "many millions of tons." to "hundreds of millions." O. P. R. O.

106. Glass-making sands (Western Australia.) P. G. H. BOSWELL. *Chem. Eng. and Mining Rev.*, **15**, 199(1923).—Glass-making sands obtained in the neighborhood of Lake Gnangara, W. A., are said to be of very high quality. B. states these sands are highly suitable for white flint glass, the best bottles, pressed ware, lighting glass, chem. app. and table ware. O. P. R. O.

107. China clay. Its composition, preparation and uses. H. F. COLLINS. *Chemistry & Industry*, **42**, 88–91, 114–7(1923).—A description of the compn., distribution, methods of working, purification, uses and economic importance of china clay. C. C. D. (*C. A.*)

Chemistry and Physics

108. Calculating heat losses in furnaces. O. I. HANSEN. *Blast Furnace & Steel Plant*, **10**, 437–40(1922); **11**, 117–22(1923).—The heat losses in boilers due to incomplete combustion of the fuel cannot be detd. with exactness with the ordinary Orsat app. H.'s method is to absorb the CO_2 in KOH and burn any H_2, CH_4 and CO present by heating the gas in a Pt capillary tube and observing the contraction. From this the percentages of combustible gases and the heat loss may be calcd. by suitable formulas. The analysis is carried out over Hg, and errors due to temp. change in the measuring buret are cut down by air cooling the water-jacketed buret and by using a compensating U-tube pressure equalizer. The method is claimed to be much superior to the ordinary Orsat method or to slow combustion or explosion methods. C. H. H., JR. (*C. A.*)

109. The rapid determination of potash in acid-insoluble silicates. Addendum. M. M. GREEN. *Ind. Eng. Chem.*, **15**, 429(1923).—Additional references are given. See *C. A.*, **17**, 501. H. G. (*C. A.*)

BOOK

110. Die physikalischtechnische Untersuchung keramischer Kaoline. JOHANNES STARK. Leipzig: J. A. Barth. 145 pp. M160. (*C. A.*)

General

111. Clay products output. ANON. *Brick and Clay Record*, **62**, 689–90(1923).—Detailed statistics of clay products output for years 1921, 1919, and 1914. J. W. H.

112. Symposiums: Casting of clay wares and oil firing of kilns. ANON. *Clay-Worker*, **79**, 462–3(1923).—Abstracts of papers read at annual meeting of N. J. Clay workers Assn. and the Eastern Section of AMERICAN CERAMIC SOCIETY, New Brunswick, N. J., December, 1922. J. W. H.

113. Ceramic Industries—Sweden. ANON. *Swedish Yearbook*, p.130(1922).—Brick, china, glass, cement and lime industries are the most important mineral industries in Sweden. O. P. R. O.

114. Air humidity and drying. P. H. PARR. *Intern. Sugar J.*, **25**, 16–20(1923).—Tables give for dry air the vol. and total heat per lb. and for satd. air the vapor wt., vol., total heat and heat increase per degree F from 40° to 100°. By the use of these tables the amt. of heat required to dry a given wt. of sugar to any given moisture content can readily be ascertained. W. L. O. (*C. A.*)

PATENTS

115. China clay. N. TESTRUP. U. S. 1,446,949, Feb. 27. Wet china clay contg. a large amt. of liquid is freed from superfluous liquid until a layer is obtained of small av. liquid content, varying through the layer, and clay is removed from the denser portion of the layer and fed as a film on to a drying surface heated by compressed vapor to a temp. only slightly in excess of that necessary to evap. the moisture in the clay. (*C. A.*)

116. Coating ceramic ware. METALLISATOR GES. Brit. 189,085, May 24, 1922. Ceramic cooking vessels are coated with Al or Fe. The vessels are heated to a temp. of 300–400° and the metal is applied by any of the known metal dusting processes. (*C. A.*)

117. Process of making vulcanization accelerators. PAUL I. MURRILL. U. S. 1,453,515. The process of making an oxidization product of a metallic salt of an organic acid, which comprises, condensing dimethylamine with carbon bisulfide, precipitating with an aqueous solution of zinc sulphate to form an insoluble zinc salt, and then oxidizing the precipitate.

BOOK

118. Water glass. A bibliography. MORRIS SCHRERO. Pittsburgh, Pa.: Carnegie Library. 83 pp. (*C. A.*)

CERAMIC ABSTRACTS

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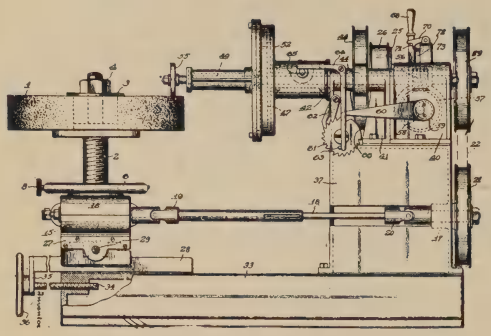
[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts* by coöperative agreement.

Abrasives

PATENTS

1. Process of manufacturing aluminous abrasives. THOMAS B. ALLEN. U. S. 1,448,586, Mar. 13. The process of manuf. of aluminous abrasive, which consists in smelting an aluminous ore with aluminium by means of electrically developed heat.

2. Grinding-wheel-test device. HARLEY H. LA VERCOMBE. U. S. 1,446,977, Feb. 27. A machine for detg. the grade of abrasive bodies, having in combination means for supporting a body, a disk, power actuated means for rotating the disk in contact with the body, and means for moving the disk away from the body when the disk has been given a predetermined number of rotations, said means for moving the disk away from the body being controlled by the means causing rotation of the disk.



3. Nonslip quartz tile. MACDONALD C. BOOZE. U. S. 1,451,456, Apr. 13. A non-slip tile comprising abrasive quartz granules and a ceram. bond uniting said grains into an integral, wear-resisting mass in which the grains form the major portion of the tread surface, said bond being more wearable than the quartz and capable of permitting renewal of the tread anti-slipping characteristics under a normal usage.

Art

4. Colored glazes in the ceramic industry. ANON. *Chem. Trades Jour. and Chem. Eng.*, **72,** 570(1923).—Utilization of the less common metals, for decorative ceramics: The oxides and compds. dealt with in this article are those of uranium titanium, cerium and allied metals, zirconium and tungsten; and they will be considered solely as constituents of glazes and enamels. Uranium compds. are of great value as the oxide of uranium can produce varying colors, depending upon the nature of the glaze and the conditions of working. The yellow oxide, or sodium uranate, gives a deep orange color in combination with a lead glaze, but with leadless or low-lead glazes, the color produced is lemon yellow, particularly in the presence of boric acid. In general, the greater the amt. of lead in the glaze, the richer is the orange color for a constant amt. of uranium. The color produced in lead glazes is not necessarily orange, for a peculiarly rich vermillion red has been produced by the use of certain propns. of sodium uranate in a lead glaze contg. zinc oxide. At high temp. (cone 8) uranium is said to be suitable for the production of colors in leadless glazes, but is somewhat difficult to use. The yellow oxide is the most suitable in porcelain glazes, maturing at cone 10, sodium uranate gives pleasing light yellow colors, but only a slight increase in color is brought about by a considerable increase in the amt. of uranium. In such glazes pleasing slate colors can be produced by glazes containing oxides of cobalt and uranium. At lower temps. green glazes can be made by blending cobalt and uranium oxides in suitable propns., and with these glazes there appears to be no danger of that discoloration often produced by the more common green chromium glazes. One of the effects of the addn. of a little cobalt seems also to be the prevention of the irregularity of color often produced by uranium alone. When fired under reducing conditions porcelain glazes contg. from

10 to 15% of black uranium oxide give brilliant but expensive jet blacks. Sol. salts of uranium are sometimes employed as under or over-glaze colors. As an under-glaze color, uranium nitrate, with a suitable base, gives good yellows under oxidizing and neutral conditions, and good greys and blacks in reducing atmosphere. As an over-glaze color, uranium nitrate has been employed in polychrome terra-cotta, the ware being first sprayed with the glaze or slip to be used as a base and the soln. of the sol. salt being applied to the required area by hand painting. It has been found that a soln. in glycerin gives the best results, since water alone allows the brush marks to show, while glycerin is not absorbed so quickly and thus permits the successive brush marks to mingle. Suitable dyes can be used to show the painted areas. Pleasing colors have been obtained by combining uranium nitrate with nitrates of iron, manganese and chromium, and with sulphate of cobalt. With the high uranium and low cobalt, greens are obtained, while with lower uranium and higher cobalt, blue glazes are produced. In combination with vanadium, as uranium vanadate, uranium is said to give an old ivory effect. The resinates of uranium, sometimes in combination with those of iron, bismuth, or gold, are used for the production of colored lusters. Titanium dioxide has been used to some extent as a coloring agent in porcelain glazes. It has been found that the addn. of 5% of C. P. titanium dioxide gives a pleasing light yellowish tint to a porcelain glaze, while the addn. of a further 5% intensifies the color to a deeper straw. 5% rutile in a similar glaze gives a good light corn yellow, while 10% gives a deeper color; but it is possible that in the last case the color may be partly due to ferruginous impurity in the rutile. When painted on the surface of a felspathic slip rutile gives good light buff and buff browns, but in this case also the color may be due mainly to iron. In combination with cobalt and a little oxide of iron, rutile can yield excellent greens, though the color is not quite so bright as that obtained in the presence of some uranium. The most promising field for the use of titanium oxide in glazes appears to be in the development of those of a cryst. nature. Extremely beautiful cryst. effects have been produced in stoneware glazes by the use of rutile; and the addn. of small quantities of the oxides of molybdenum, tungsten, vanadium or uranium has been found to promote the development of the crystals and to give pleasing colorations. Wonderful cryst. effects have also been produced by introducing rutile into a china glaze contg. zinc oxide, and the titanium appears to be essential for the production of good crystals. Titanium dioxide has been found to be a useful opacifying agent for enamels, since it produces unusual durability and a very glossy surface which is resistant to abrasion. Cerium and allied metals: little information, beyond scattered references, chiefly in German lit., is available regarding the use of cerium compds. in glazes. Calcined cerium phosphate, after fritting with niter at cone 13 is said to yield at temps. between cones 9 and 14, with felspathic and other glazes, brilliant yellows which are resistant to oxidizing and reducing conditions. Cerium carbonate and cerium oxide (from the calcination of the oxalate) have been found to give good results when used as opacifiers in enamels for iron ware. Further investigations regarding the coloring power of cerium compds. in glazes of varying compn. would not only possibly prove to be of value to the ceram. indus., but would also help, if satisfactory results were obtained, to find an outlet for a portion of the large quantities of cerium compds. produced as residues of the rare earth industry. At present only a small fraction of the total cerium earths produced from monazite can be utilized. With regard to the utilization in the ceram. indus. of the other elements of the cerium group, there is little information published, but praseodymium, and neodymium phosphates have been employed to a limited extent in porcelain manuf. Tungsten and zirconium: Information regarding the use of these metals in glazes is even more difficult to find than is that concerning cerium. Good brown colors have been produced by means of phospho-tungstic acid, while similar results are obtained by the use of tungstic acid

in combination with iron and manganese. Results of doubtful value have been recorded with tungstic acid as an active agent for the development of under-glaze reds. Calcium tungstate, in combination with small quantities of a thorium or radium salt, imparts self-luminous properties to colored lead glazes, the luminosity being permanent when radium is used, but somewhat transient in the case of thorium. It is well known that zirconia has been found to be a good opacifying agent in enamels, but it does not appear to have been used in pottery glazes. O. P. R. O.

5. Gilding glazed clay vessels. P. P. BUDNIKOV. *Ber. Polyt. Iwanowo-Wosniessensk*, **6**, 211–20(1922).—B. has examined various methods of gilding glazed clay ware. A suitable gilding soln. is produced by pptg. Au from soln. in aqua regia by hydrous $FeSO_4$. The ppt. is ground with 8–10% of a flux consisting of 6 pts. of basic Bi nitrate and 0.5 pt. of anhyd. borax, mixed with oxidized turpentine and lavender oil, and applied to the wares. A bright Au film is produced after baking at 650–900°. Paler hues are obtained if about 30% by wt. of AgCl is mixed with the gold. "Sulfur balsam" may likewise be employed for gilding. 100 g. of dry French turpentine are mixed with 20 g. of S and 20 g. of Venetian turpentine and boiled gently on an oil bath. Acid must be distd. off at intervals, and it is best to carry out the distn. in a stream of CO_2, a long glass tube being employed as a reflux condenser. To 8–9 pts. of the balsam so prepd., a soln. of $AuCl_3$ contg. 1 pt. of Au, 4 pts. of concd. HCl, and 4 pts. of HNO_3, diluted with H_2O, is added, and the mixt. heated on an oil bath until the Au dissolves. H_2O is removed, and 7–8% of lavender oil and 12% of French turpentine are added, and the mixt. is heated until completely mixed. The resulting mass is dissolved in CS_2 and filtered. The CS_2 is evapd. off, and 5–8% of basic Bi nitrate added, and the resulting mass applied to the wares, which are then carefully baked at 450–600°. The reactions occurring have been investigated by studying the interaction of S and pinene. $C_{10}H_{16}S$ or $C_{10}H_{16}S_2$ is probably formed by reaction between pinene and S. With $AuCl_3$, the compd. $C_{10}H_{16}S.AuCl_3$ is probably formed, and by baking, this is probably decomposed into $C_{10}H_{16}Cl_2$, Au and SCl_2. Gold sulfide gives only a mat film, under the conditions of the expts. "Sulfur balsam" may be prepd. by the interaction, at room temp., of S_2Cl_2 and turpentine, the evolution of H_2S and HCl being prevented by cooling. Used in conjunction with $AuCl_3$ this gives even better films than the first-mentioned balsam. J. S. C. I.

PATENTS

6. Metallizing articles. QUINTIN MARINO. U. S. 1,452,281, Apr. 17. A process of metallizing articles composed essentially of non-conductive ceram. ware, which comprises applying to the surface of the article, while such surface is substantially free from glaze, a soln. of silver nitrate in an alcoholic solvent, allowing the alcohol to evap. applying to the surface a reducing agent contg. the formic acid radical, brushing the surface of the article with a metallic brush, applying to the surface of the article, a warm soln. containing silver cyanide, washing the article, and thereafter electro-depositing a metallic coating upon said article. Cf. *Ceram. Abs.*, **1** [8], 217(1922).

7. Gold coating mixture for glass or porcelain. JIRO ISHIKAWA. Japan. 40,632, Nov. 14, 1921. Ten g. of Au is dissolved in aqua regia, 38.5 g. of "balsam sulfide" is added and the mixt. evapd. to dryness on a sand bath. The residue is washed with H_2O, and mixed with Al, U, and Bi resinates and the whole is dissolved in a mixt. (*A*) of 200 g. of lavender oil, 100 g. rosemary oil, and 100 g. $PhNO_2$. "Balsam sulfide" is prepd. from 60 g. turpentine, 36 g. oil of turpentine, 16 g. flowers of S, 50 g. lavender oil, 10 g. $PhNO_2$ and 20 g. rosemary oil. The 3 resinates are prepd. from (1) K alum 50 g., resin soap 100, Al soap 10 and *A* 190; (2) U nitrate 50 g., resin soap 100 g., and *A* 150 g., (3) Bi subnitrate 2.3 g., resin 15.3 g. and lavender oil 32 g., resp. (*C. A.*)

Cement, Lime and Plaster

8. Alca cement. H. S. SPACKMAN. *Concrete* (Mill Section), **22,** 35–6(1923); cf. *Ceram. Abs.*, **1** [12], 337(1922).—Alca (= Al+Ca) cement has been manufd. in Europe since 1912, from bauxite and limestone. Its av. chem. compn. is CaO 35–45%, Al_2O_3 35–45%, Fe_2O_3 5–12%, SiO_2 5–12%. The cement is now made at 3 French works and at 1 Swiss works. Each works sells the cement under its own trade name, such as "Ciment Electrique," "Ciment Fondu," etc. Alca cement attains a very high early strength, and evolves considerable heat while setting, which favors its use in cold weather. Alca cement could be manufactured in the U. S. from native raw materials but the cost would be higher than for Port. cement. Economy in using the material tends to offset the high cost of production. J. C. W. (*C. A.*)

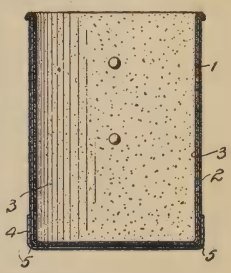
PATENT

9. Waterproof hardening agent of cement. KOMAKICHI KATO. Japan. 40,368, Oct. 19, 1921. The agent is a mixt. of soy-bean protein 100 g., NaOH 50 g., $Al_2(SO_4)_3$ 35 g., and AcONa 30 g. It is used by painting its aq. soln. with a brush on materials manufd. from cement or by mixing with cement. NaOH may be replaced with a mixt of Na_2CO_3 and $Ca(OH)_2$; $Al_2(SO_4)_3$ with alum and AcONa with soap or $Ca(AcO)_2$. (*C. A.*)

Enamel

PATENT

10. Enamel-ware protector. ALBERT E. PLOYER. U. S. 1,447,180, Mar. 6. The combination of a vessel enameled on the outside, and a protecting-ring of copper, arranged around the lower portion of the vessel, and having an annular integral portion extending inwardly under the bottom of the vessel.



Glass

11. Hydraulic mining of silica a marvel of mechanical ingenuity. ANON. *Glass Container*, **21,** 30(1923).—Described methods practiced at Clayton, Ia., where 5 men handled 7 carloads of glass sand per day, or almost 400 cu. yds. without touching the sand. Sand is 99½% pure. Illustrations. Deposits are enormous. One area of almost pure silica stretches for 10 miles at an elevation of 952 ft. A hydraulic stream, tumbler, separating vats and cars are all the equipment necessary. Fifty-five ton cars are loaded in 18 min. W. M. C.

12. Study of the return and breakage problem of milk bottles. ANON. *Glass Container*, **9,** 10 and 45(1923).—Part II. Checking up on mechanical operations in milk plants and careful supervision of delivery men result in reduced breakage and greater returns. With illustrations, Sheffield Farms, Inc., one of the largest N. Y. companies expends between $700,000 and $800,000 per annum for milk bottles. Breakage in washing averages between 1 and 2%. W. M. C.

13. Electric glass furnace. ANON. *Schnur. Rev. Glass Works*, **7** [74], 1563 (1923).—Not used because of cost, high local temp. and poor color of the glass due to carbon. The advantages are simpler installation, shorter melting period, cleaner furnace and a small furnace may be used. Power required is 2 kilowatt hour for 1 kg. of metal. R. J. M.

14. Health problems of industry. C. E. A. WINSLOW. *Glass Worker*, **42** [32],

11(1923).—A series of 8 special articles on this subject including efficiency, ventilation, lighting, dust, sanitation, fatigue, etc. R. J. M.

15. Fluorescence and coloration of glass produced by β-rays. J. R. Clarke. *Philosophical Mag.* (London), **45,** 735–6(1923).—Glass tubing, after treatment with radium emanation until the color change is complete, was heated at different temp., and the rate of decolorization and the duration of fluorescence measured. The duration of fluorescence in min. ranges from 13 at 110° to 0.5 at 350° C. At the annealing temp., the change is practically instantaneous. It is probable that the fluorescence and decolorization are associated with changes in the state of mol. aggregation of the glass. When manganese is present in the glass the color after radiation is purple, whereas the normal color is brown. Cf. *Ceram. Abs.*, **1** [12], 328(1922). O. P. R. O.

16. Analysis of bubbles in glass. J. W. Ryde and R. Huddart. *Royal Phys. Soc. of London,* April 27(1923).—The analysis of bubbles in glass has been investigated by the research staff of the Gen. Elec. Co. of London: In order to distinguish bubbles generated by chem. action in glass from those introduced by mechanical processes spectroscopic tests are made for the presence of nitrogen. In order to liberate the gas from the bubbles a specimen of the glass was placed in one limb of a quartz U-tube and mercury in the other, and the glass was heated and then disintegrated by sudden cooling, the tube being plunged into cold water at the same time the mercury was thrown on to the glass. The method does not readily lend itself to quantitative applications, as the line intensities are much affected by the fact that the discharge takes place in a mixt. of gases. O. P. R. O.

17. Daughters of American Revolution plan to preserve ruins of old glass factory. Anon. *Glass Container,* 22, 38, 40(1923).—Old Pitkin Plant at Manchester, Conn., of historic interest to state and industry started in 1783. W. M. C.

PATENTS

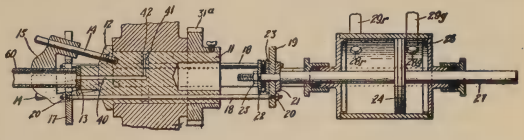
18. Ovenware and holder therefore. Harry Negbaur. U. S. 1,450,330, Apr. 3. A baking dish made of transparent boro-silicate glass having a yellowish tinge and provided with mineral coloring material fused into the glass near one surface, whereby the dish is rendered translucent and colored.

19. Leer. Lewis Steelman. U. S. reissue 15,603, May 15. An annealing leer for hot glass articles, comprising a heated fur. portion at the entry end of the leer and a tunnel portion having a gradually decreasing temp. extending therefrom to the exit end of the leer, the leer being arranged for continuous movement of the articles through the heated and tunnel portions to anneal the same in a gradually decreasing temp., the fur. portion comprising a muffle chamber with an open end leading into the tunnel extension flues surrounding the muffle portion of the leer chamber in which the articles to be annealed are placed, the side portions of which consist of a plurality of vertically extending flues, said flues being formed of interlocking tiles, an air and gas supply to the flue system, connections within the fur. structure for directing the flame and products therefrom substantially evenly on both sides of the muffle in the side flues, a conduit system beneath the heated muffle chamber in heating relation to its floor, said system receiving the products of combustion from the side flues and leading the said products of combustion in a horizontal longitudinal flow to stack connections, said stack connections being out of the path of travel of the articles being annealed and intermediate the length of the leer and adjacent the end of the heated portion, substantially as described.

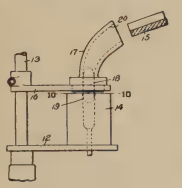
20. Glass tile for covering walls. Marcel Anspach. U. S. 1,454,842, May 15. A method of prepg. glass tiles for wall coverings consisting in coating the back of said tiles with a paste contg. a clayey earth, oil, turpentine, a resinous varnish and a siccative, and baking at a moderate temp. the tiles thus coated.

21. Glass-drawing apparatus. WILLIAM GRAY. U. S. 1,449,038, Mar. 20. (See *Abs.*, **31**, p. 178).—An app. for drawing sheet glass comprising an endless member for carrying the sheet, an endless member of greater length associated therewith, teeth on said latter member to engage the margin of the sheet on one side, a shorter endless member with teeth to engage the margin of the sheet on the other side, and a sep. cooling bath for each of the last two endless members.

22. Glass-blowing machine. MINER P. WETMORE. U. S. 1,446,026, Feb. 20. The combination, with a revolving chuck having radially movable jaws of an operating connection from said jaws through the chuck spindle, rotatable therewith, a ball bearing on the rear of said connection, and means for producing movement of said ball bearing along the line of the axis of the chuck spindle.

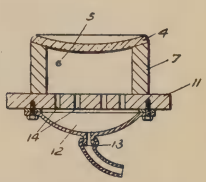


23. Apparatus for the manufacture of bifocal lens blanks. JOHN R. POWELL. U. S. 1,451,957, Apr. 17. In an app. for fusing bifocal lens blanks comprising a support for the major lens blank and a support for the minor lens pivotally mounted thereon having its free edge extended over the edge of the major lens support.

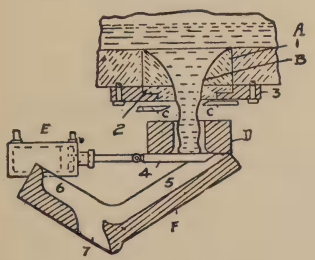


24. Process of and apparatus for feeding molten glass. WILLIAM A. LORENZ. U. S. reissue 15,600, May 15. In an app. for handling gathers of molten glass the combination with a conducting trough and a shaping mold of a curved inclosing funnel located between the delivery end of the trough and the mouth of the mold for conducting the gathers from the trough to the mold and shaping them while being so conducted.

25. Antæus glass. JOEL C. WELLS AND EDGAR D. TILLYER. U. S. 1,454,200, May 8. The process of producing protection lenses consisting in heating the lens uniformly and subsequently cooling one face of the lens while the other is in a plastic condition. The process of producing a curved protection lens consisting in surfacing the faces of the lens in flat form, subjecting the blanks after surfacing to sufficient heat to drop the lens to desired curve without impairment of the polished surfaces thereof, and suddenly chilling one face of the blank to produce a surface tension in the finished blank, increasing the resisting properties thereof.



26. Process and apparatus for feeding glass. WILLIAM J. MILLER. U. S. 1,451,707 Apr. 17. The method of feeding molten glass from a container provided with a discharge orifice through which the glass is caused to protrude which consists in accumulating the glass beneath the discharge orifice to form gathers, detaching said gathers from the glass protruding from said orifice, discharging said detached gathers, and reversing the gathers after they are discharged, for the purpose described.



27. Machine for making pressed glassware. THOMAS C. MOORSHEAD. U. S. 1,445,345, Feb. 13. A machine for making pressed glassware, comprising, a source of glass supply, a mold, a receiver adapted to gather a measured quantity of glass from said source means for dipping and for exhausting said receiver to gather the glass including main and auxiliary valves in series, said main valve being adapted to re-

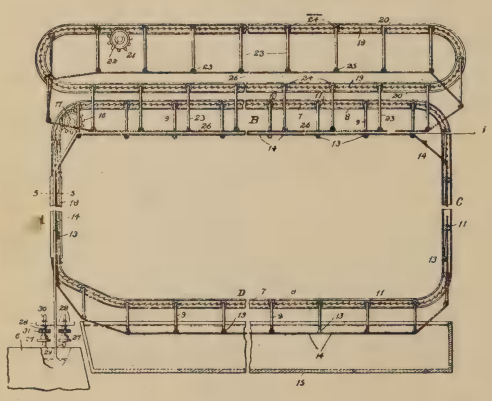
main open for the full dip of said receiver, and said auxiliary valve being adapted to close before said receiver rises, means for depositing the glass in said mold, and a former adapted to coöperate with said mold to press the glass to shape. In a machine for making glassware having glass molding means including a mold, mechanism for removing the formed article from the mold, comprising an ejector movable through the bottom of the mold, a coöperating retainer movable over the top of the mold, and means for removing the article from said ejector and said retainer.

28. Glass and process of making same. WILLIAM CHITTENDEN TAYLOR. U. S. 1,449,799, Mar. 27. The hereinbefore described method of overcoming the yellow tint imparted to acid boro-silicate glasses by iron oxide which consists in adding a salt of neodymium oxide to the batch from which such glass is melted.

29. Means for transferring glass to molds. LEONARD D. SOUBIER. U. S. 1,446,670, Feb. 27. A glass transfer device comprising a reciprocable carriage, a sectional transfer cup on said carriage and reciprocable therewith from a receiving position to a discharging position, the upper end of said cup being open to receive glass, and the section of the cup on the side towards the receiving position being slidable away from the other section, resilient means normally holding the sections together, and a stop for arresting the slidable section as it approaches discharge position and thereby opening the cup.

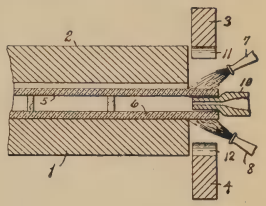
30. Means for transferring molten glass. JOHN MURL LENTS. U. S. 1,446,649, Feb. 27. In gob transferring mechanism, the combination of a gob transferring device rotatable about a horizontal axis and provided with a series of cups arranged at intervals around its periphery, means to rotate said device step by step and thereby bring said cups successively to a receiving position, said rotating means comprising a rock arm, means to rock said arm, a rotary member connected to rotate said transfer device, a connecting pin carried by said arm, automatic means to actuate the pin and connect said arm with the rotary member for rotation therewith while the arm moves in one direction and to disconnect said pin and permit said member to remain stationary during the return of said arm, a locking pin, and automatic means to move said locking pin into engagement with said rotary member and hold the latter in locked position while disconnected from the rock arm.

31. Glass-drawing apparatus. WILLIAM GRAY. U. S. 1,450,590, Apr. 3. In app. for drawing glass, the combination with a reservoir for molten glass, of drawing app. located thereover, and upright shafts located on opposite sides of the margins of the sheet being drawn and having outstanding fingers that engage said margins between the drawing app. and reservoir, to maintain a predetd. width to said sheet. In an app. for drawing sheet glass, the combination with a reservoir for the melted glass, of means for drawing a continuous sheet of glass vertically therefrom and then bending the sheet into the horizontal plane, comprising two endless series of articulated flat plates, the sheet being guided by one series of plates in its vertical run, and gripped between the two series in its horizontal run.

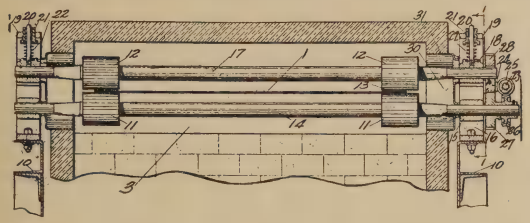


32. Process of making hollow panes of glass. IVAN M. KIRLIN. U. S. 1,448,351,

Mar. 13. The process of forming hollow panes of glass which consists in heating two similar sheets of glass between flat retaining plates, introducing a tube between the edges of the sheets at one point, heating the edges to fusing point and forcing them together and around the tube to hermetically seal the edges together and the tube in position and at the same time forcing air through the tube into the space between the sheets to hold them against the retaining plates, cooling the pane until no longer malleable, and then exhausting the air from its interior.

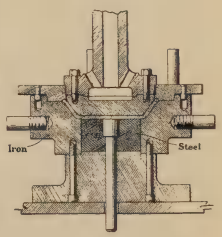


33. Leer conveyor for sheet glass. HORACE E. ALLEN. U. S. 1,450,571, Apr. 3. In a leer for continuous sheet glass, a series of idler rollers for supporting the glass sheet, and a series of means engaging the sheet between certain of the idler rollers at spaced intervals throughout the leer for advancing the sheet over the idler rollers. In a leer for continuous sheet glass, a series of idler rollers for supporting the glass sheet, a series of idler edge rollers, resting freely on the upper edge portions of the glass sheet to hold the sheet in rolling contact with the supporting rollers, and pairs of driving rolls engaging the edges only of the sheet for advancing the sheet through the leer.



34. Mold. ROWLAND D. SMITH. U. S. 1,449,789, Mar. 27. A part for molding glassware made of a steel containing from 10% to 15% chromium, and from $^1/_2$% to 5% cobalt.

35. Mechanism for conveying hot glassware. MICHAEL J. OWENS. U. S. 1,455,966, May 22. In app. for transferring hot glassware, the combination of an inclined chute down which articles are carried by gravity, a horizontally traveling conveyor, a table beneath the chute onto which the articles are discharged from the chute, said table being rotatable about a vertical axis and in substantially the same horizontal plane as said conveyor, and means to guide articles from the table onto the conveyor, the point at which the articles are discharged onto the table being so arranged that the articles are carried on the table through the greater portion of a complete rotation and pass beneath the chute to the conveyor.



BOOK

36. Glass-making in England. HARRY J. POWELL. New York: Macmillan Co. 183 pp. $10.

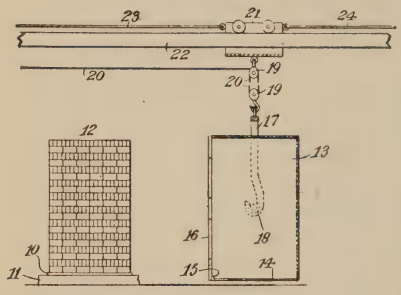
Heavy Clay Products

PATENTS

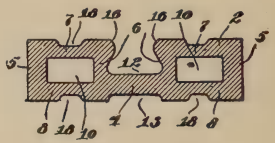
37. Apparatus for unloading kilns by hopper, lifting device, or the like. RAYMOND C. PENFIELD. U. S. 1,444,206, Feb. 6. App. of the kind described, comprising a brick carrying hopper, adapted to be positioned adjacent a stack of brick, rods adapted to slide on said hopper and extend forwardly thereof over the stack of brick, means on the outer ends of said rods to separate a predt. mass of brick from the stack and means to retract the rods and thereby slide the mass of brick thus sepd. into the hopper.

38. Apparatus for unloading kilns by conveyer belts. RAYMOND C. PENFIELD. U. S. 1,444,207, Feb. 6. Mechanical brick handling app. of the kind described comprising continuously moving brick engaging devices adapted to separate a plurality of brick in a stack, and to move the same from stacked position, comprising means to maintain the brick engaging devices in a substantially vertical line while entering the plane of the brick to be removed.

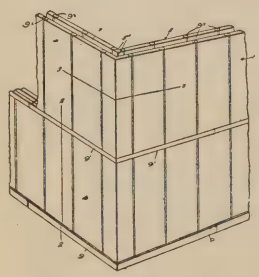
39. Brick-handling apparatus. HENRY O. POND and ARTHUR W. MELLEN, JR. U. S. 1,443,966, Feb. 6. In an app. for handling bricks and other articles piled in stacks, a receptacle constituting a carrier, having a front opening to receive and discharge the stack as a unit, releasable means for closing said front opening to confine the articles in the carrier during transportation, means associated with the bottom of the carrier to support the articles in the carrier but permitting the carrier to be loaded by horizontal movement over the stack, and a pivoted support for the carrier whereby the carrier may be swung to permit discharge of the articles downwardly by gravity through said front opening.



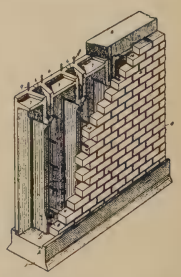
40. Brick. RICHARD BLAIR COOPER. U. S. 1,444,167, Feb. 6. A channel brick of the kind described, comprising a plurality of wall sections and a central area connecting the same together, mortar grooves in each wall section, and an overhanging finger grip on the inner edge of each wall section to constitute an eccentric handhold for the brick.



41. Building construction. ARTHUR W. KRUSEE. U. S. 1,447,868, Mar. 6. A building of the class described having its walls formed of a double row of slabs spaced apart to form an air space, each slab having recesses in its side edges, reinforcing means passing through the slabs and projecting into the recesses, metal strips bridging the space between the rows and having their ends located in the recesses, means for connecting the strips and the reinforcing members together in the recesses and a cement filling in said recesses enclosing the connected ends of the strips and reinforcing members.



42. Wall construction. EDWARD F. NEEDHAM and THOMAS H. NEEDHAM. U. S. 1,448,078, Mar. 13. A wall construction including adjacent wall slabs, the edges of said slabs being formed with ribs which extend at approx. right angles to the face of the slabs, the ribs of the adjacent edges of adjoining slabs fitting together and the upper ends of said adjacent ribs being spaced apart to form a recess between them, a transverse web connecting the upper ends of the edge ribs of the respective slabs, and an outer veneering for the wall.



43. Brick-surfacing machine. JACOB STOCKE, JR. U. S. 1,451,187, Mar. 10. A brick surfacing machine comprising a brick press having a ram, a table secured to said press, strips secured to said table, cutters secured in one of said strips and extending

therefrom, a movable end scoring blade adapted to be moved across the ends of a brick by the downward movement of the ram.

44. Brick kiln and method of setting and burning. WILLIAM J. SULLIVAN. U. S. 1,444,220, Feb. 6. That improvement in the art of burning brick which consists in building a kiln with relatively narrow arches and substantially twice the number heretofore employed, supplying heat to each arch in desired amount to bring the kiln to initial temp., then reducing the heat in each arch to prevent overburning of the arch brick and maintaining said reduced heat until the burning is completed.

45. Brick and tile machine. ROY H. MCELROY, JOSEPH D. CITE and ALBERT G. LANGENKAMP. U. S. 1,450,506, Mar. 17. In a machine for extruding plastic material a base casting consisting of a base member, an extruding casting member, a gear and shafting supporting member, and an outboard casting member all of said members integral with one another in a single casting, and reinforcing means consisting of dividing walls cast integral with said several members and the base member for maintaining the several parts together as a unit and reinforcing them, and an auger working in said extruding casting.

46. Brickmaking apparatus. HENRY W. B. GRAHAM. U. S. 1,452,152, Mar. 17. In app. of the class described, the combination with a brick machine having a filling station and a mold push out, of means for moving empty molds into position for feeding to said filling station, said means including a swingable receiver adapted to support a mold in position for engagement by said push-out. In a brick making machine, the combination of a pair of supports correlated to support molds and permit movement thereof from one support to the other, means for moving molds from one support to the other, one of said supports being pivoted whereby it may be moved to form a gap between them, and means for operating said pivoted support about its pivot to permit the delivery of a mold through the gap and the positioning of the mold on one of said supports.

Refractories

46a. Bauxite (France). ANON. *Chem. Trade Jour. and Chem. Eng.*, **72,** 668 (1923).—Fr. is now the predominant producer of bauxite in Europe and the principal producer of the world before the war, her output of 309,000 T being $^3/_5$ of the world's output; is now 2nd to the U. S., Ark. showing the most notable increase. O. P. R. O.

47. Keramite bricks. ANON. *Süddeutsche Tonind., Brit. Clayworker*, **32,** 17–18 (1923). A number of works have been engaged for some time in Switzerland, Sweden, Austria and Hungary producing Keramite brick. These brick are very hard and strong. The body consists of a well-ground clay and quartz sand, or some similar material. The clay serves as a bonding and sintering medium, while the sand serves to raise the melting point. Clay and sand are mixed together dry, whereupon 6 to 8% water is added to enable the mixture to be dry pressed. The brick are then pressed with 250 atmos. These brick are often fired at cone 13. In Hungary, Keramite brick have long been in use as a paving material and have proved exceptionally durable. They have a mean compression strength of 64,000 lbs. per sq. in. The paving blocks are usually made of the following dimensions: $11^1/_2''$ by $4''$ by $2^1/_2''$ to $3''$. They consist of 54 SiO_2, 14 Al_2O_3, 8 Fe_2O_3, 16 CaO and 4 to 5 MgO. Owing to the high CaO content the Budapest brick are yellowish green in color. H. G. S.

48. Rammed linings replace bricks. ANON. *Brit. Clayworker*, **37,** 17(1923).—Owing to the high price of fire brick, the use of rammed lining of ganister or silica rock is becoming popular. It is true that bricks cannot be dispensed with in some types of furnaces, but the number which might use rammed linings is very large. Steel furnaces, cupolas used in foundries, calcining furnaces, lime kilns, vertical cement kilns, and many

reverberatory may use rammed linings. About 20,000 tons of ganister are used each month in Germany for this purpose. The material employed is an almost pure silica rock which is crushed to powder, mixed with about 2% of CaO, and then ground into a stiff paste with water. The furnace is fitted with adjustable lining rings or with blocks, which are placed so as to act as one side of a mold, while the fur. wall acts as the other side. The space between them is filled with the paste which is then rammed or tamped into position. When the lining is completed, the rings or blocks are removed, and the furnace is "dried out" in the usual manner. No fire brick or blocks are used at all, and the experience of 4 yrs. of this practice has shown it to be highly economical. The results obtained have proved so good that the near future may see the discarding of most of the bricks and blocks now used. Patching is done after every heat, and a relining is not necessary within 2 yrs. H. G. S.

49. Carbonized brick. W. Smith. *Brit. Clayworker*, **32**, 17(1923).—Carbonized brick are produced by treating clay with carbon-charged gases, being different from brick made with a mixture of C and clay. Carbonized clay falls into two groups, i. e., black and white, the former providing a material adapted for heat resistance in reducing atmos., while the latter should be used in furnaces where air is freely admitted. As a heat conductor, the clay should be used in the black condition, as a non-conductor, in the white. Carbonized clay is recommended for filter beds, and the production of high-class acid-resisting ware, while its hardness is just short of SiC. The carbonized brick conducts with twice the efficiency of the standard fire brick. Attention is drawn to the possibility of liberating Fe_2O_3 from red clays by this process. Alkalies may also be liberated from clay by this process. See *Ceram. Abs.*, **2** [5], 101(1923). H. G. S.

PATENTS

50. Manufacture of self-hardening refractory articles. William A. France. U. S. 1,451,540, Apr. 10. The method of manufacturing refractory articles, such as furnace-lining bricks, which consists in mixing magnesite with other elements including magnesium chloride in a molten condition, forming the same, and finishing the resultant by subjecting it to the drying action of air and without burning.

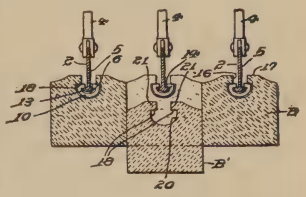
51. Refractory article and method of making the same. Frank B. Danehower. U. S. 1,450,140, Mar. 27. A refractory article of manuf. being a baked product and comprising a comminuted refractory body and the residue of decomposition of synthetic phenol resin which acts as a bond for the comminuted refractory body.

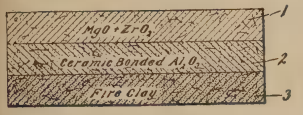
52. Method of molding brick shapes. Charles L. Norton. U. S. 1,444,519, Feb. 6. In the designated method of molding brick-shapes of granular non-plastic material, accumulating a mold charge at a height above a mold, and simultaneously depriving said charge substantially in its entirety of both vertical and lateral support.

53. Furnace. Perry R. Cassidy. U. S. 1,448,194. A stationary substantially horizontal fur. or oven comprising a stable continuous curved inner wall of refractory material under compression, and an outer metal shell surrounding the same for maintaining the inner wall under compression and resisting stresses due to expansion thereof the metal shell being provided with a slip joint and means for maintaining the same under constant tension.

54. Fire arch for furnaces. Ernst Emil Frozeth and Terry Blixt. U. S. 1,452,295, Mar. 17. A fire arch of the class described consisting of a number of suspension blocks, the same being widest at their lower ends and arranged so as to form with their lower ends the entire under side of the arch, means for hanging the suspension blocks in a boiler or furnace, and a number of downwardly tapered wedge blocks adapted to be inserted and substantially fill the space in between the suspension blocks above said lower ends.

55. Suspended furnace roof. WILLIAM C. STRIPE. U. S. 1,448,879, Mar. 20. In a structure of the class described, the combination of a hanger beam having an enlarged lower portion, means slidable on said beam and adapted to engage said portion to receive support therefrom and a brick having an under-cut slot adapted to receive said slidable means when moved into said slot from either end thereof, the overhanging portions of the brick adjacent the slot operating to retain said means from vertical displacement therein.





56. Laminated superrefractory article. MILTON F. BEECHER and MACDONALD C. BOOZE. U. S. 1,448,684, Mar. 20. A laminated refractory article having a facing of bonded refractory material, a reinforcing backing layer of ceram. material which is reactive with an ingredient of the facing, and a neutral intermediate layer intimately joined to and separating the facing and backing layers.

Terra Cotta

57. The effect of nickel salts on the color. G. M. TUCKER. *N. J. Ceramist*, **1** [4], 268(1921).—Four calcines were prepd. as follows:

A	1 Part Salt 5 Parts Flint	B	1 Part Salt 2½ Parts Zinc 2½ Parts Flint
C	1 Part Salt 2½ Parts Whiting 2½ Parts Flint	D	1 Part Salt 2½ Parts Calcined Magnesite 2½ Parts Flint

In each of these calcines the following were substituted successively for the "salt:"

1—Nickel	7—Nickel formate
2—Basic nickel carbonate	8—Nickel borate
3—Nickelic hydrate	9—Nickel sulphate
4—Nickel hydrate	10—Nickel silicate
5—Nickel nitrate	11—Nickel oxide green
6—Nickel chloride	12—Nickel oxide black

These calcines were ground dry and burned to cone 5½ in a commercial terra cotta kiln, reground and washed. 5% of each calcine was substituted successively in each of the two glazes. One glaze contd. cornwall stone, high content of CaO and no zinc. The other glaze was of the bristol type. Colors obtained varied throughout a considerable range which is given in detail. It appears that magnesium oxide in calcine D exerted greater influence on color than the nickel itself when used in the bristol glaze.

C. W. P.

58. An unusual experience with flat roofing tiles. ANON. *Brit. Clayworker*, **32**, 18(1923).—Tile fired in Hoffman kilns had the ordinary "porous" body, yet both surfaces had cracks with a distinctly vitrified, glassy appearance. The following explanation was given. During firing, certain physical and pyrochemical changes occur in the body of the tile. Firing to maturity produces, in the main, a softening of the mol. composing the mass. In this condition, which precedes actual melting, the adhesive force acting between the mol. is practically suspended. If, at this point, a cold current of air comes into contact with a portion of the tile causing local shrinkage, a crack is

the result; but since the individual mol. in this condition possesses no cohesion, the resulting fracture appears smooth. The conclusion to be drawn from these considerations is that any abrupt cooling of the tiles, while at the high temp. must be avoided.

H. G. S.

59. Slip glazed ware. ANT. HÜTTL. *Keram. Rundschau*, **31**, 89(1923).—Brown ware is made in many portions of Germany. The appearance of this ware varies in different localities depending upon the nature of raw materials necessary to make this glaze. Many clays can be used in their natural state to produce glazes if fired sufficiently high but fluxes are usually added to reduce their maturing temp. The analyses of a slip glaze is as follows: SiO_2 = 59.10%, Al_2O_3 = 11.72, Fe_2O_3 = 4.16%, CaO = 7.46%, MgO = 1.84%, K_2O = 4.83%, CO_2 = 6.09% and loss on ignit. = 4.80% which corresponds to the following formula:

$$10.04\ SiO_2,\ 0.136\ Al_2O_3 \left\{ \begin{array}{l} 0.029\ FeO \\ 0.095\ CaO \\ 0.049\ MgO \\ 0.051\ K_2O \end{array} \right.$$

Slip glazes are cheaper than artificial glazes. The Na in wood ashes is often dissolved in water and this soln. is mixed with the glaze having the proper consistency. The Na thus introduced lowers the maturing temp. and improves the quality of the glaze.

H. G. S.

PATENTS

60. Porcelain having the appearance of granite. TOMOTARO KAWAMOTO AND GOSUKE KATO. Japan. 40,582, Nov. 29, 1921. A mixt. of feldspar 50, silica 20, marble 20, clay 10, and limestone 5 parts is crushed, passed through a sieve having 15–20 mesh per 3 cm. and mixed with coarse granules of granite. The mixt. is molded under 40 lb. pressure and heated at 1300° for 10 hrs. (*C. A.*)

61. Purification of gypsum. SHOTARO FUKATA. Japan. 40,417, Oct. 25, 1921. Impure waste or pptd. gypsum (1 part) is burned at 128–190° until the H_2O content becomes less than half a mol. for 1 mol. of gypsum and then powdered. About $^1/_{10}$ part of H_2SO_4 (65° Bé.) is dild. with 20–30 parts of H_2O and heated at about 100°; the powdered gypsum is gradually added and agitated. Monoclinic crystals gradually develop. When the crystn. is completed, the product is sepd. from the acid, washed with H_2O and dried below 60°. (*C. A.*)

Whiteware

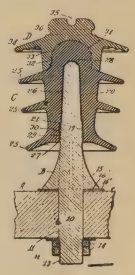
62. Some notes on materials and processes in electrical porcelain manufacture. T. A. KLINEFELTER. *N. J. Ceramist*, **1** [4], (1921).—A somewhat detailed discussion of the processes employed in the manufacture of both high and low tension elec. porcelain together with some remarks upon the phys. properties of the burned wares. C. W. P.

PATENTS

63. Tool for decorating crockery. HYMAN KISSNER and DAVID BLUM. U. S. 1,445,627, Feb. 20. A tool for decorating crockery comprising a wheel of resilient material having a bevel peripheral face, a separate design strip secured on the bevel face, and a suitable mounting for the wheel for operating the same.

64. Insulator. LOUIS STEINBERGER. U. S. 1,446,135, Feb. 20. An insulator and supporting pin therefor, said insulator having a bore extending thereinto from the lower side or end thereof, the pin fitting and extending into end bore, said bore and pin having their adjacent surfaces smooth and free from protuberances or projection throughout the upper and greater

portion of their extent, mutually engaging securing means between the insulator and the supporting pin, said securing means located only at the lower end or side of the insulator and remote from the apex of the pin, and a seat for the line wire on the upper end or side of the insulator remote from said securing means.



Equipment and Apparatus

65. Heating electric steel furnaces. M. Gillot and V. Guillermin. *Rev. ind. minerale*, **1**, 249–57(1921); *Rev. metal.*, **18**, 590.—Furnaces give the best results with a surface of bath not over 1.20 m.^{2} per electrode for small furnaces and 1.80 m.^{2} for 15-ton furnaces. The output per electrode should be not over 3–4 amp. per cm.^{2} for carbon and 12 for graphite. Various little known methods are described for economizing heat by prevention of leakage, better conduction and convection within the furnace, and construction of electrodes. C. C. D. (*C. A.*)

66. Some developments in gas producers. T. R. Wollaston. *Iron Coal Trades Rev.*, **106**, 196(1923).—Results obtained from gas producers of the recovery and non-recovery type are compared with those from an improved plant. Diagrams indicate the sources of loss and inefficiency as compared with the new plant; these are expressed in B. t. u. and money value. The R-G plant which furnished the data has a producer 9 ft. in diam. of 1300 lb. capacity per hr. The fuel is introduced through a retort in contact with hot exit gases and is thus partly coked, while the gases are enriched. The steam for the process is raised in an annular boiler around the unlined producer body. Blast satn. and superheat are derived from a central cone-shaped boiler within the producer which acts as a flash boiler. The precoking leads to a wide extension of the range of common fuels available, to practical elimination of clinkering, to great ease and economy of working, and to the production of a gas of unusually high value, CO_2 10.6%, CO 18.8, H_2 24.4, CH_4 3.9, total combustible 45.1, heating value range 164.5 to 182.5 B. t. u. J. L. W. (*C. A.*)

67. Calite, a new alloy resistant to high temperatures. J. Gaillard. *Usine*, June 17, **1922**; *Rev. universelle mines*, **16**, 317–8(1923).—Calite is an Al-Ni-Fe alloy made in a basic Heroult elec. furnace by fusing and decarbonizing scrap steel, removing the dross, adding Ni, reducing the melt and adding approx. 25% of scrap calite by wt. to the charge. When homogeneous, the metal is run into a previously heated receptacle contg. the requisite amt. of Al, and from this to the molds. It is hard, and either hot or cold is highly resistant to shock. It is not oxidized below 1300°, can be used indefinitely at 1200°, is easily sol. in 25% H_2SO_4, is insol. in HNO_3, is very slowly dissolved by HCl, is not attacked by fused carbonates, chlorides, nitrates, cyanides, Pb, Zn, Sn, S and S vapor, but is attacked by cryolites, borates and silicates. It melts at 1525°, softens at 1370°, can be worked at 1200–1300°, has d. 7.07, Brinnel hardness after annealing 286, hardness by the scleroscope after annealing 40, thermal cond. 25% that of Fe, tensile strength 25.8 kg. per mm.^{2} The % compn. is not given. C. C. D. (*C. A.*)

68. Relation between current, voltage, and the length of carbon arcs. A. E. R. Westman. *Trans. Am. Electrochem. Soc.*, **43**, preprint (May, 1923). C. H. E. (*C. A.*)

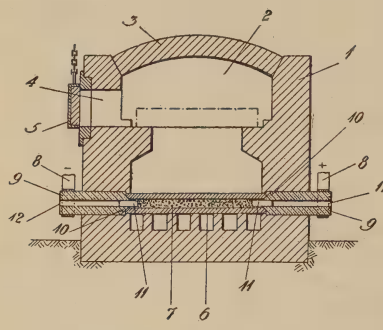
PATENTS

69. Rapid decorating firing furnace or kiln. Ransom W. Davenport. U. S. 1,451,815, Mar. 17. In a furnace for heat treating bodies, a tubular member for contg. bodies, means for heating the central portion of the wall of the tubular member, a plunger for moving the bodies through the tubular member, and means for directing a chem. reagent through the tubular member.

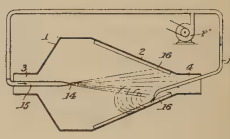
70. Sifting testing machine. Willard J. Bell. U. S. 1,450,166, Mar. 3. In a sifting testing machine, the combination of spaced shaking plates adapted to receive

testing sieves therebetween, a series of connected resilient sieve-engaging arms interposed between said sieves and one of said plates, and a handle on one of said arms adapted to permit such arm to be swung away from said sieves to allow of removal thereof.

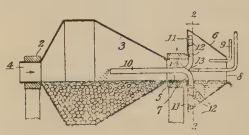
71. Method and device for the heating of material in electric furnaces. EUGEN ASSAR ALEXIS GRÖNWALL. U. S. 1,450,543, Apr. 3. An elec. fur. comprising refractory pipes, auxiliary resistances of carboniferous material disposed in said pipes, a pair of hollow electrodes in contact with said pipes, and an auxiliary electrode in each of said hollow electrodes and extending into said pipes for ensuring a satisfactory transmission of current from the electrode to said auxiliary resistances.



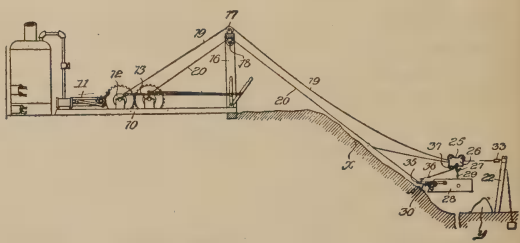
72. Oversize return for mills. HARRY W. HARDINGE. U. S. 1,450,290, Apr. 3. A grinding mill comprising in combination, a rotatable grinding drum having a substantially unobstructed overflow conical outlet portion for the classification of material according to size, a classifier into which said drum discharges, and means for automatically returning oversize material from said classifier to said drum through the end of said conical outlet portion.



73. Apparatus for entraining and removing fines from conical mills. HARRY W. HARDINGE. U. S. 1,450,289, Apr. 3. The combination with a conical grinding mill comprising a rotatable drum having a conical outlet portion for automatically classifying material according to size, provided with an outlet opening for discharging the material when ground, of a jet which discharges into said conical outlet portion adjacent the base thereof and directed toward said outlet opening, said jet and conical outlet portion cooperating to form an ejector and means for supplying elastic motive fluid to said jet under pressure.



74. Excavating machine. MILTON S. LONGNAKER. U. S. reissue 15,571, Apr. 3. In app. of the class described, an inclined cable or support, means for slackening and drawing the cable taut to alter its degree of inclination, a movable carriage arranged to travel on the inclined cable and movable thereon in one direction by gravity, a pivotally hung load conveying device suspended from said carriage for free pivotal movement, and an operating cable connected to said conveying device and arranged to haul the same in the opposite direction.



75. Press for forming briquettes. JEAN RÉOL. U. S. 1,454,906, May 15. A double compression press comprising a fixed support, a rotary mold table, an operating lever pivoted on said support, a compression plunger pivotally connected to the operating lever, an ejector plunger also pivotally connected to said lever, a second compression

plunger arranged to move in the opposite direction to the first, a rod and lever connecting the second compression plunger to the operating lever, a hydraulic cylinder, a piston therein, a block carried by said piston, the said connecting lever being arranged on said block, and a rotary cam arranged to impart max. speed to the table during the periods between compression and to hold the table against movement during the periods of compression.

76. Separator. Thomas J. Sturtevant. U. S. 1,454,140, May 8. A separator for grading materials, comprising, in combination, a screen, a support therefor beneath the screen, and means for vibrating said support and screen including an eccentric mechanism connected to said support and having minute eccentricity and rotatable at high speed, said screen being unattached to said support, that it may float and tremble on the support with independent vibrations.

77. Shale planer. Joseph M. Powell. U. S. 1,454,519, May 8. A shale planer, comprising a pivot car, a track on which said pivot car is mounted, means for feeding said pivot car forward along said track, a frame pivotally mounted on said pivot car, means in addition to said pivot car for supporting said frame and permitting it to swing about its pivotal mounting on the pivot car, and a perpendicularly extending shale-cutting mechanism carried by said frame.

78. Furnace gas producer. Clifford E. Wentzel. U. S. 1,455,181, May 15. The combination with a fur. comprising a combustion chamber and an ash pit, of a bed plate interposed between said ash pit and said combustion chamber and having an opening therein, a structure movable into and out of a position to close said opening and adapted to support fuel and ashes in said combustion chamber, and a tuyere supported by said bed plate, extending across said opening and having outlets arranged to discharge into the fuel and ashes on said movable structure.

Chemistry and Physics

79. Physics in the ceramic industries. J. W. Mellor. *Inst. Physics*, May 9 1923.—The specific applications of sound, light, heat, electricity and magnetism, and mechanical science in the manuf. of pottery and glassware, demonstrating that physical principles can render great service to the ceramic industries. Fire brick are actually rejected when they do not give a sonorous ring; yet silica brick, made with calcined quartz, are not inferior in spite of their leaden ring. Light, copper-blue glazes can be matched in artificial light, but cobalt and chrome colors cannot. If the absorption spectra of metallic oxides had been better known, certain troubles would not have arisen with cobalt-blue lamp bulbs during the war; the reddish glow of these lamps can be cured by the addition of chromic oxide, but not by copper oxide. The changes of quartz into α and β tridymite and cristobalite observed by the detn. of the refractive indices, are not approved by some silica brick-makers. Others look to X-ray examn. for further help. Iron particles are removed from clay by magnetic separators, but the problem of the sepn. of cupriferous pyrites by electromagnetic or electrostatic methods remains unsolved. The processes of firing ordinary bricks are efficient; of the fuel spent in firing biscuit-ware only 2% is utilized and improved fur. flues and screens, useful in the early stages of the operations, might be disastrous in the later stages. During the first stages the loss of water and the contraction proceed at the same rate. Later, the contraction ceases, though the loss of water might continue, and contraction strains should be studied apart from thermal strains. The manufacturer should be asked whether special shapes leave a good safety margin in manuf. and use. Circular plaques crack in radial lines, oval plaques in directions toward either focus. When clay passes through a long-nosed pug-mill, a slab cut in the direction of motion has a greater contraction than when taken at right angles thereto. M. had at first thought the wetter

clay accumulated near the axis; but the flat particles seemed to travel broadside, like a coin sinking face downward in water. A bat of clay distorted during drying can be straightened by damping and drying it under pressure; but during the subsequent firing the particles contract again. Elec. fur., invaluable for high-temp. work, are unsatisfactory for pottery firing. Gas and coal firing acts mainly by convection currents, elec. heating by radiation; large electrically-heated chambers might be provided with mechanisms to ensure better gas circulation and convective heating. The many French measurements of the expansion coeff. of glazes and bodies have so far proved of no practical value, not because they are in themselves useless, but because the problems involved are very complex. O. P. R. O.

80. Studies of the clays. II. Centesimal and rational analyses, use of microscope. O. Boudouard and J. Lefranc. *Bull. soc. chim.*, **31**, 1145–52(1922); cf. *Ceram. Abs.*, **2** [5], 110(1923).—The rational analysis of Vogt depends on the facts (1) that clay, kaolin and mica are dissolved by boiling H_2SO_4, but quartz and feldspar are almost unattacked. (2) Boiling NaOH soln. (sp. gr. 1.8) attacks biotite but not muscovite. A centesimal analysis is made and an analysis of the portion extd. by boiling H_2SO_4. From these figures the kaolinite, muscovite, sand, H_2O and undetd. constituents are deduced. It is shown that the results of the rational analysis may be deduced from the centesimal analysis by ordinary methods of chem. calcn. Microscopic examn. greatly aids in the lithologic interpretation of the centesimal analysis. L. W. R. (*C. A.*)

81. The dissociation of calcium sulfate at higher temperatures. P. P. Budnikov and J. K. Syrkin. *Chem.-Ztg.*, **47**, 22(1923).—Dissociation begins in the neighborhood of 800°. At 1375° the dissociation pressure apparently reaches 1 atm.; melting occurs simultaneously. The decompn. products are CaO and SO_3. The results of the analysis upon the former and the differences in weight, upon heating, are given. Heating to 1000° as in the formation of *Keene's cement* produces only a small quantity (about 3.2%) of CaO. H. C. P. (*C. A.*)

82. A new viscosimeter. P. Lecompte du Noüy. *J. Gen. Physiol.*, **5**, 429–40 (1923).—This app. utilizes the principle of coaxial cylinders. An outer cylinder contg. the liquid rotates around a plunger immersed in the liquid. There is a direct proportionality between the torque due to the friction exerted by the liquid on the plunger when the outer cylinder is rotating and the rate of rotation. The readings are, therefore, proportional to the rate. The app. is particularly adapted to the measurement of colloidal and physiol. solns. Less than 1 cc. of liquid is required for a measurement. Other advantages are: Rapidity of operation (30 sec. to 1 min. for a reading), accurate temp. control, large range and ease of changing the range, great sensitivity. It can be used as a recording viscosimeter. C. H. R. (*C. A.*)

83. The development of mineralogical methods. T. L. Walker. *Am. Mineral.*, **8**, 41–6(1923).—Presented chronologically, the methods which have been developed for mineralogical research and description are: the Wernerian (use of the more obvious phys. properties); geometrical (crystal form) ; chem.; petrographic (microscopic study of transparent minerals); synthetic (artificial production of minerals); mineralographic (microscopic study of opaque minerals); and the method of Friedel and Laue (X-ray detn. of cryst. structure). E. F. H. (*C. A.*)

PATENTS

84. Method of recovering vanadium from its ores. Philip Aleander Mackay. U. S. 1,450,507, Apr. 3. A method of recovering vanadium pentoxide from the other oxides combined with it in vanadium ores, particularly lead oxide, by subjecting the ore to the action of oleum at a suitable temp., reducing the vanadium pentoxide to vanadium tetroxide, in order to obtain vanadyl sulphate, and subsequently diluting the soln. with water to ppt. the insol. constituents of the ore and to leave the vanadium in soln.

85. Reduction of oxides of metals of the chromium group. RICHARD EDGAR PEARSON AND EUSTACE NEVILLE CRAIG. U. S. 1,448,036, Mar. 13. A process for the reduction to lower oxide of the tri-oxide of a "chromium-group" metal which consists in immersing a cathode in an intimate pasty mixt. of the powdered oxide and an electrolyte in which it is insol. and passing a direct current through the mixture.

86. Process for the manufacture of borax and boric acid. ANDREW KELLY. U. S. 1,450,975, Apr. 10. A process for the manuf. of borax characterized by treating sodium pentaborate by adding thereto a sodium salt and ammonia.

87. Process of producing zirconium dioxide. OTTO RUFF. U. S. 1,454,564, May 8. A process of treating zirconium ores, which comprises strongly heating the ore with a carbonate of an alkali metal, the mixture contg. for each mol. equiv. of zirconium oxide about .75 to 2 mol. equiv. of said carbonate, and for each mol. equiv. of alumina and silica, about 1 to 1.5 mol. equiv. of said carbonate, and thereafter dissolving the water insol. zirconium compds. in an acid.

88. Method of separating zircon from undesired substances. LOUIS E. BARTON AND CHARLES J. KINZIE. U. S. 1,451,004, Apr. 10. The method of treating ores contg. zircon and therewith entangled undesired substances which comprises commingling therewith an alkali metal bisulphate, heating the charge, livixiating the resulting product, and sepg. its liquids from its zircon residuum.

89. Method for making plastic gypsum. ROBERT E. HAIRE. U. S. 1,457,161, May 29. The herein described method of making plastic gypsum, consisting in passing calcined gypsum through a tube mill with substantial exclusion of air in circulation through said mill to thereby prevent loss of the water content during the grinding, the material being allowed to discharge at the periphery of the mill when the desired degree of plasticity is reached.

90. Process of producing magnesium nitrate. VICTOR MORITZ GOLDSCHMIDT. U. S. 1,454,583, May 8. A process of producing magnesium nitrate which comprises treating olivine and serpentine with nitric acid of 25–40% at a temp. of 50–90°C, whereby the silicic acid is pptd. in an easily filterable state.

91. Process of making sodium-silico fluoride. HENRY HOWARD. U. S. 1,456,594, May 29. Process of making alkali silico fluorides which comprises acidulating phosphate rock with sulphuric acid, sepg. the resulting solution from insol. material, adding to the soln. an alkali in quantity insufficient to convert the phosphoric acid in the soln. to the mono alkali salt, and recovering the resulting precipitate of alkali silico fluoride.

General

92. New Jersey's part in the ceramic history of America. LEROY H. MINTON. *The Ceramist*, **2** [4], (1922–23).—A sketch of the historical development of the ceramic industry in New Jersey, together with statistical information regarding the production of various kinds of wares. C. W. PARMELEE

93. The hardening and the speed of solution of calcined gypsum. P. P. BUDNIKOV AND J. K. SYRKIN. *Z. anorg. allgem. Chem.*, **125**, 257–68(1922).—A study of (1) the rate of soln. of gypsum calcined at temps. from 100 to 800°, (2) the role of the insol. form in retarding the hardening and (3) the peculiarities of the crystn. process. All samples were heated from 5 to 8 hrs., cooled rapidly, ground fine and 2 g. digested in a const. vol. of H_2O at 20°. A definite procedure was used since the soly. may vary up to 20%, depending upon the size of particle (cf. *Z. physikal. Chem.* **37**, 385). Gypsum calcined at 115–25° was composed chiefly of $CaSO_4.{}^1/_2H_2O$ and rapidly formed a strongly supersatd. soln., based on $CaSO_4.2H_2O$. The soly. then decreased to a soln. only slightly supersatd. The existence of a soln. satd. with respect to $CaSO_4.{}^1/_2H_2O$ could not be verified, indicating that the rate of crystn. of $CaSO_4.2H_2O$ was approx. the same as

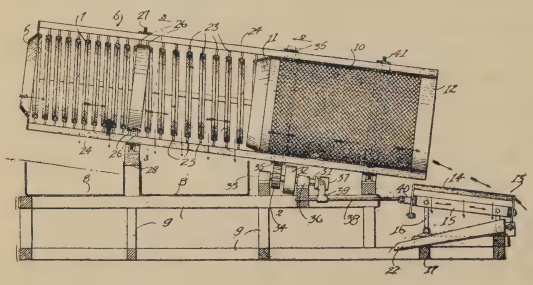
the rate of soln. of the hemihydrate, though the rate of crystn. exceeded that of the soln. of the hemihydrate, preventing the existence of a hemihydrate soln. Calcined at higher temps., soln. took place rapidly and then ceased, with no max. supersatn. or subsequent decrease in soly. as with calcination at 120°. A great difference was found between the products calcined at 400° and 500°. With the 400° product, supersatn. and hardening still took place, but with the 500° product, a normal satd. $CaSO_4$. $2H_2O$ soln. existed after 8 hrs. (cf. Glasenapp, *Studien über Stuckgips, totgebrannten und Estrichgips*, Riga, **1908**). If hardening were a result solely of the pptn. of dihydrate, dead-burnt gypsum would not harden, but since it does set slowly, a transformation of the insol. form of $CaSO_4$ to the sol. form must occur. Though boiling ordinarily reduces the ability of gypsum to form supersatd. solns., it had the opposite effect on that calcined above 400°, the rate of transformation to sol. $CaSO_4$ being accelerated. Calcined from 500 to 800°, gypsum showed a much retarded rate of soln. At first it dissolved rapidly until all the sol. form of anhydrous $CaSO_4$ was in soln., after which the insol. form of anhydrous sulfate (the chief constituent) passed into soln. extremely slowly only after transformation to the sol. form. Dead-burnt gypsum contains considerable amts. of sol. anhydrous sulfate and its inability to harden is due to a phys. retardation by the insol. form. A sharp transition temp. of calcination from hardening to non-hardening properties could not be detd., though with rise in temp. of calcination the soly. decreased progressively and hardening was retarded; this was probably due to increasing proportions of the insol. form of anhydrous $CaSO_4$. See also *Ceram. Abs.*, **2** [6], 121(1923). C. C. D. (*C. A.*)

PATENTS

94. Treatment of clay. William Feldenheimer and Walter William Plowman. U. S. 1,447,973, Mar. 20. In the treatment of clay, the step consisting in effecting deflocculation of the clay by admixing the latter with an aqueous soln. of a resin in an alk. solvent therefor. See *Ceram. Abs.*, **2** [6], 138(1923).

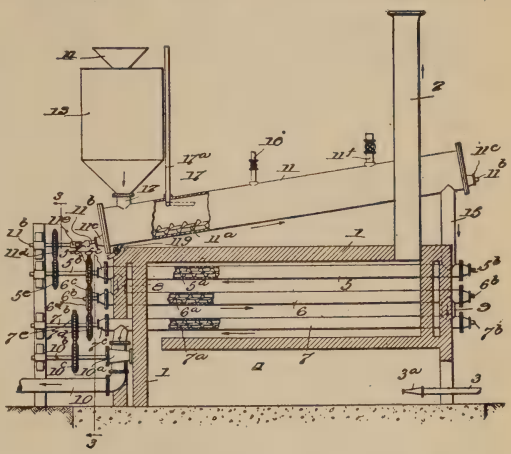
95. Composition of matter for cleaning crystal and glassware. Julia Etta Grover U. S. 1,449,281, Mar. 13. A compn. of matter for cleaning glass and chinaware, formed by mixing and boiling substantially sal soda, borax, sulphur, oil of citronella, alum, chlorinated lime, glycerine and water.

96. Apparatus and method for sampling ores. Fred Mason Martin. U. S. 1,488,758. In the art of obtaining samples of a sticky material, the method which consists in causing a mass of the material to move continuously in a compact stream of substantially equal cross-sectional area thereby to insure the passage per unit of time of equal amounts of the material, causing said stream to fall freely in air disintegrating said compact stream while falling freely and unrestrained, periodically removing from equally spaced apart portions of said uniform disintegrated stream, a relatively small amt. of the material and assembling all of said small amt. removed from the stream to form a fair sample of the whole mass.



97. Grading apparatus. Jay W. Ellenwood. U. S. 1,450,145, Mar. 27. In an app. of the character described, the combination of a revolving inclined cylinder having an open receiving and discharging end, supporting means for said cylinder, means for rotating said cylinder, a coil mounted within said cylinder, said coil being

formed of material having a triangular cross-section with one of the apexes directed toward the interior of said coil, the convolution of said coil increasing in spaced relation one to the other from the receiving end toward the discharging end, a screen adapted to receive material from said coil and discharge said material at its opposite end, a riddle comprising a reciprocating frame, a series of spaced parallel ribs mounted thereon, a central bar rigidly supported on said frame, the other of said bars being pivotally attached to said frame, means for adjusting said bars with respect to each other and means for reciprocating said frame simultaneously with the rotation of said cylinder and coil.



98. Apparatus for the combined solvent and destructive distillation treatment of shale. DAVID T. DAY. U. S. 1,447,296, Mar. 6. App. for extracting hydrocarbon oil material from oil bearing shales which app. comprises retort means for distilling shale, a treatment chamber capable of holding a bath of oil and having an opening for the introduction of fresh shale, a shale discharge opening for the discharge of treated shale, a discharge opening for the aeriform material produced, and an opening for the discharge of extracted oil material, means for removing shale from said chamber and passing it to said shale discharge opening, and a pipe directly connecting said chamber and said retort for conducting directly into said chamber material distilled from shale in said retort.

Official Personnel of Divisions—1923–24

	Art	Enamel	Glass	Heavy Clay Products	Refractories	Terra Cotta	White Wares
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Vice-Chairman	J. C. Boudreau		J. H. Forsyth	F. T. Owens	F. A. Harvey		
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Committee on Standards (*a*) Tests (*b*) Products	W. J. Stephani C. F. Binns	(*a*) E. P. Poste	Tests: A. E. Williams; L. R. Milford. Refractories: D. E. Sharp; C. E. Fulton; W. F. Brown; A. S. Zopfi; G. Aurien; C. O. Grafton	P. H. Bates W. G. Worcester S. Geijsbeek W. P. Blair	R. F. Ferguson M. C. Booze R. M. Howe	(*a*) C. W. Hill D. F. Albery (*b*) J. L. Carruthers	(*a*) G. Sladek A. V. Bleininger (*b*) A. S. Watts[1] J. P. Rodgers Chas. Golding E. W. Turner Jno. Manor C. N. Franzheim T. A. Kleinfelter C. C. Treischel
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[1] Special Committee on Feldspar specifications.

CERAMIC ABSTRACTS

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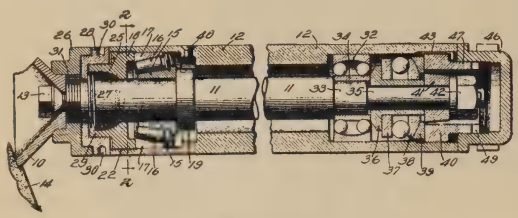
[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts* by coöperative agreement.

Abrasives

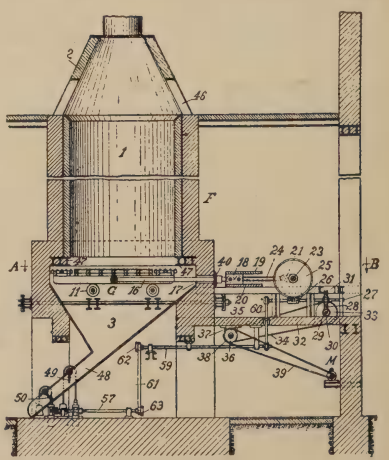
PATENT

1. Dressing tool for grinding wheels. THURE LARSSON. U. S. 1,455,213, May 21. A dressing tool for grinding wheels comprising an open ended housing, a rotatable shaft mounted therein and having one end projecting therefrom, a cutting disk on the projecting end, means to exclude dust from the inside of the housing, adjustable radial bearings within the housing adjacent said projecting end of the shaft, radial bearings for the opposite end of the shaft, adjustable bearings for receiving end thrust only, and means for positively adjusting each set of said adjustable bearings independently of the other set to take up radial and longitudinal wear.



Cement, Lime and Plaster

2. Slump test for concrete. ANON. *Indus. Australian & Mining Standard*, **59**, 757(1923).—In order to standardize mixts. of concrete to a definite specification the "slump" test may be employed. Newly mixed concrete is placed in a mold, and lightly tamped, which when filled is removed immediately and the settlement of the concrete noted. If the slump or settlement is not in accordance with the specifications the amt. of water can be increased or decreased as may be required. For stiff concrete, the slump should not exceed 2″ and concrete of this consistency will require punning. For a concrete which will flow around reinforcement, a slump of 6″ is suitable, and if the reinforcement be intricate, this quantity may be slightly increased. The amount of variation in the quantity of water is not great, and this test is very sensitive and delicate; an increase of 10% in the quantity of water will increase the slump by several inches. The mold is made of metal, in the form of a hollow truncated cone about one foot long, 4″ in diameter at the top, and 8″ in diameter at the base, and provided with handles at the sides. The test can be made in a few minutes, and by its adoption the strength of concrete structures will be more uniform. At the present time expts. are being conducted to develop a method, that will enable the volume of water to be detd. for each given slump. O. P. R. O.



PATENT

3. Continuous furnace for burning cement and the like. RUDOLF THIELE. U. S. 1,451,379. A continuous furnace of the character described, having a shearing-grate consisting of grate-sections adapted to be reciprocated in their own plane in opposite directions to each other, clinker-crushing teeth on said sections and means for reciprocating said grate-sections.

Glass

4. Accurate glass tubes, manufactured by the Küpper process. ANON. *Chem. Age,* **8,** 615(1923).—The Küpper process for the manufacture of glass tubes with absolutely accurate internal diameters was subject of a rept. recently made to the Aix la Chapelle section of the German Chemists. According to the "Küpper" process an accurately cylindrical metal core is inserted into the drawn glass tube; thereupon the tube is evacuated and the outside is slowly heated up. Thus the glass becomes soft and the outer atmospheric pressure forces the walls into intimate contact with the metal core so that the interior of the tube takes exactly the dimensions of the metal core. The glass tube has a higher coeff. of exp. than the metal core: after cooling, therefore, the core can easily be withdrawn from the tube and may be inserted into another tube to be calibrated without any prepn. being required. A great number of tubes made by the Küpper process was presented at the meeting, and it was demonstrated that one metal plunger fitted a number of precision syringes with equal accuracy. O. P. R. O.

5. Electrical properties of flint glass of density 6.01. G. L. ADDENBROOKE. *Phil. Mag.,* **45,** 516–25(1923).—Hopkinson (*Trans. Roy. Soc. London,* **1878**) announced that the ratio K/D is approx. const. for all glasses over a range from $D = 2.87$ to 4.5, where D is density and K is the dielec. const. A. employs a glass of approx. compn.: SiO_2 22%, PbO 78%, and of d. 6.01. Fragments were used employing the method of mixts. Details of the elec. method and the calcn. are given. The very high dielec. const. 13 was obtained, giving a K/D value that fits in well with those of Hopkinson. The ratio K/N^2 (N is the index of refraction of the D line) is 3.55, the highest ever found for any normal substance. The evidence indicates that the glass is a true compd., $PbSiO_3$ dissolved in an excess of SiO_2, and not merely a mixt. of SiO_2 and PbO.
S. C. (*C. A.*)

6. Progress in the glass industry. LEON APPERT. *Bull. soc. encour. ind. nat.,* **134,** 728–65(1923). E. H. (*C. A.*)

7. Gas producer and furnace practice in the glass industry. RICH. SCHNEIDER. *Glashütte,* **52,** 625–7, 641–2, 657–8, 673–6, 689–93, 707–8, 723–4, 755–6, 771–2, 787–8 (1922); 26 figs. J. B. P. (*C. A.*)

Heavy Clay Products

8. Scumming on roofing tile. ANON. *Tonind. Ztg.,* **47,** 272(1923).—Sol. salts in clay cause scumming on roofing tile which has heretofore been prevented by the addn. of $BaCO_3$ to the clay. The price of $BaCO_3$ is, however, becoming so high that many manufs. were forced to abandon the use of this preventative. Some manufs. have succeeded in reducing the amt. of $BaCO_3$ by adding a certain percentage of finely ground sand. This sand is ground to a powder in a ball mill. Since the sand contains practically no sol. salts while the clay does, the amt. of $BaCO_3$ required is reduced in propn. to the amt. of sand added. H. G. SCHURECHT

9. Handling clay with belt conveyors. STAFF ARTICLE. *Brick and Clay Record,* **62,** 1136–7(1923).—Description of the system used for clay storage at Don Valley Brick Co., Toronto, Ont., and diagram of belt conveyors used for carrying ground and unground clay. J. W. H.

10. Construction and adjustment of dies. H. F. DINGLEDINE. *Brick and Clay Record,* **62,** 1130–1(1923).—Dies for hollow tile may be roughly divided into two classes, flat and tapered. Flat dies are never lubricated and are suitable under certain unusual conditions. Tapered dies may be lubricated with steam, oil or water. Hollow tile dies are of the tapered non-lubricated type. Angle of taper apparently is dependent upon the individual clay. To establish correct angle for a given clay, the most satis-

factory method is to start with a die having a small amt. of taper and then gradually increase the angle of taper to the point where the column speed is at a max. When this angle is passed the column speed diminishes, and when once established it is found to be fairly constant with a given clay for different shapes. However, when building dies, the angle of taper should be somewhat smaller than that found best (1) to allow for future wear (2) since no taper is better than too much taper, as a die with too much taper is more sensitive and more difficult toad just to the slight changes in clay and in tempering, (3) since the remedy involves heavy overhanging baffle plates at the back of the die which slow up the column and disturb the compactness of the clay in the side walls. Light short issue dies cause less trouble, are easier to adjust, lighter to handle and consume far less power. The raw material is the deciding factor. Hard running clays require heavy dies with strong bridges and posts and any increase in thickness of metal back of die serves as a baffle to movement of clay. After the interference back of die is reduced to a min. in shape of bridges and posts, the next step in die design is to distribute the interference as evenly as possible to permit uniform flow of clay. Cracking in drier is largely due to bridges being too close to back of die. To overcome this, move bridges back, use softer clay or serrate bottom of bridges. In dies with square corners, it is generally necessary to give areas around corners more clay, because of the great friction at corners of the die. This is accomplished by giving the die slightly more taper around the corner or slightly baffling the straight sides. J. W. H.

11. Brick-making in Czechoslovakia. Rudolf Barta. *Rev. Mat. Constr. Trav. Pub.*, **164**, 88B(1923).—Production amts. to 2,000 million of brick and 200 million of tile per yr. Plastic clays are mixed with sand and water in large cylinders, and then pressed moist. After drying, the brick are burned in continuous kilns of the Kohout-Hoffmann type. L. N.

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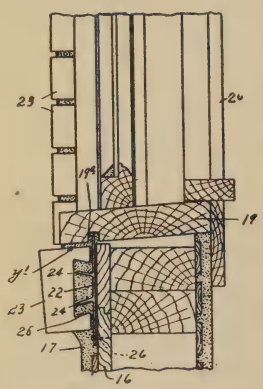
12. Method of and means for making bricks. Bernard F. Weber. U. S. 1,454,826, May 8. The method of making and assembling bricks which comprises, extruding clay through a die in a parallel-sided stream, assembling slugs of a plurality of brick lengths in parallel relation to each other, and cutting the assembled parallel slugs at right angles into brick lengths.

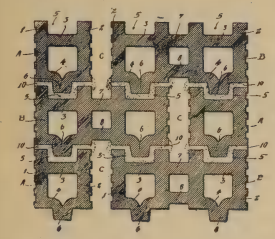


13. Brick machine. Henry W. B. Graham. U. S. 1,454,165, May 8. The combination with means for filling molds with material for making bricks, of mold return means, mechanism for inverting each mold and separating the mold and bricks, and means coöperating with said inverting and separating mechanism to turn the empty mold right side up and deliver it to said return means.

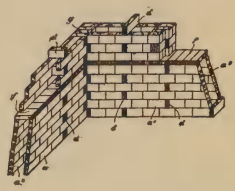
14. Brick trim for walls. Michael Liptak. U. S. 1,454,293, May 8. The combination with a wooden wall having a wooden framed window opening of masonry-faced metallic trimming strips applied around the outer portion of said framework and interlocking therewith and secured to said wall, said wall having a stucco outer covering imbedding portions of the metallic facing strips and united with the masonry facing thereof.

15. Brick-faced metallic trim. Michael Liptak. U. S. 1,454,294, May 8. As a new article of manufacture, a metallic base plate formed with an irregular face, cement interlocked to said base plate, and bricks held in bond by said cement and by the latter indirectly secured to said base plate.

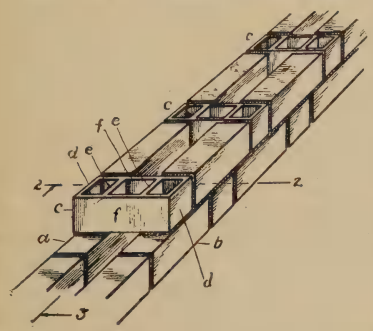
16. Building construction. LEO KROONEN. U. S. 1,451,340, Apr. 10. A wall structure combining a plurality of horizontally disposed interlocking hollow building blocks each having horizontal top and bottom walls and vertical connecting side walls extending above the top wall to form a mortar groove, the bottom wall of each block being formed with a longitudinal tongue vertically aligned with said groove and having converging side walls and positioned and embedded in mortar in the mortar groove of the adjacent block.

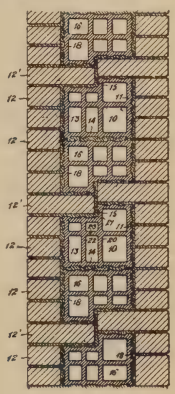


17. Hollow wall. FRITZ ECKERT. U. S. 1,451,439, Apr. 10. A hollow wall of standard bricks wherein there are interposed in the courses formed of stretchers separate bonding bricks in such a manner that the vertical course is interrupted repeatedly and the vertical shaft is shut off at these parts and several complete courses of headers laid flat dividing the whole of the hollow space into horizontal passages.



18. Wall construction. HARRY R. KREITZER. U. S. 1,456,063, May 22. A wall consisting of two parallel courses of wall members spaced apart so as to provide a space of substantial width between the courses, and transverse bonding members connecting said courses, the ends of said bonding members being supported in said courses, said bonding members being made of hollow tile consisting of longitudinal vertical webs, transverse end webs and other transverse webs intermediate the ends, the intermediate webs being supported on the inner-edge portions of said courses, thereby leaving the air space between said courses unobstructed except by the longitudinal webs of said bonding members.





19. Building block and construction. JOHN EISENMANN. U. S. 1,456,373, May 22. A backing or filling block for brick walls, said block having the full width of one bearing side formed in the same plane, and an offset in the other bearing side corresponding to half the depth of one course of the brick.

Refractories

20. Thermal capacity of bricks. F. TSCHOPLOWITY. *Brit. Clayworker*, **32**, 91 (1923).—The sp. ht. of poor conductors such as bricks may be detd. without the use of expensive calorimeters as follows: A cylindrical glass tube closed at one end, without any rim and about $1^1/_2$ in. diam. is provided with a rubber stopper about $^1/_2$ in. thick and supports a chem. thermometer, the bulb of which extends to about $^1/_2$ in. from the bottom of the tube. About 80 cc. of water is placed in the tube and the latter, with its contents, is maintained at a convenient temp., by means of a water bath. An accurately weighed amt. of material (reduced to pieces about $^1/_{12}$ in. diam is heated to 100° C, until it has attained this temp. The material is then transferred rapidly to the tube,

and the rise in the temp. of the contents is noted, the tube being kept in the water bath all the time. The temp. of the water bath is gradually increased by the addn. of hot water, so that it becomes nearly the same as the contents of the tube. The sp. ht. is then found from the following formula: $C = W(a—b)/D(e—a)$. Where C = the sp. ht., W = the wt. of water in the tube, a the highest temp. attained by the mixture, b is the temp. of the water before adding the material to be tested, D the wt. of the material, e the temp. of the hot material. Detns. made in this manner show a sp. ht. of 0.216 for fire brick and 0.184 for common brick as compared with 0.23, which figure is generally accepted. H. G. S.

21. Destruction of coke oven walls. M. PULFRICH. *Tonind. Ztg.*, **47,** 271–2 (1923).—Considerable spalling and breaking off of pieces of silica brick were observed in a coke oven wall. This trouble first occurred after the brick had been in service one year. Analyses of the brick showed that they were of high quality and that they had a softening point of cone 35. It was found that the brick was well burned and therefore this trouble could not be attributed to the expansion accompanying the transition of quartz to tridymite. The mortar which had a compn. very similar to the silica brick was next examd. and found to be composed largely of unchanged quartz which was just commencing to change to tridymite. As this change is accompanied by an increase in volume it caused the otherwise stable wall to disintegrate. The selection of a sand of the mortar which is more easily converted to tridymite is suggested as a possible means of overcoming this trouble. H. G. S.

22. Blue mountain refractories. ANON. *Min. Eng. Rec.*, **27,** 78(1923).—Tests made on the clays from the property of these refractories at Whonnock, B. C., show they carry 51.2% aluminum oxide, thus approaching bauxite. These clays are said to be the richest clays in aluminum, known to exist in Canada. O. P. R. O.

23. Preparation of pure zirconium oxide. H. VON SIEMENS AND H. ZANDER. *Wiss. Veröffentl. Siemens-Konzern*, **2,** 484–8(1922).—Brazilian zirconia (67.8% ZrO_2, 22.2% SiO_2, 8.7% Fe_2O_3, TiO_2) mixed with 25% of charcoal was heated at 1000–1200° in a stream of Cl, and the mixt. of chlorides evolved collected in a fireclay vessel. Complete reduction was not effected, only about 80% of the zirconia being reduced. There appeared to be no catalysis due to the presence of Fe and Ti. The phys. condition of the ore appears to play some part in the reduction, as slightly ignited zirconia powder is readily reduced, while powd. sintered fragments are not reduced. The mixt. of chlorides obtained is dissolved in water and the soln. evapd. to incipient crystn. The crystals of $ZrOCl_2$ thus obtained are preferably washed with a mixt. of alc. and concd. HCl in equal proportions, or alternatively, the crystals are slaked with water until completely hydrated and no further evolution of Cl occurs. The hydrated mass is dissolved in the hot alc.-HCl mixt. and the soln. crystd. by cooling. The crystals are ignited in air in order to obtain pure Zr oxide. J. S. C. I.

24. Recent electric-furnace developments. E. T. MOORE. *Blast Furnace Steel Plant*, **11,** 153–8(1923); cf. *C. A.*, **16,** 22, 686.—A total of 416 elec. furnaces had been installed or contracted for in the U. S. up to Dec. 1, 1922. There was a tendency toward the use of a greater no. of small furnaces. No appreciable interest in elec. furnaces was indicated among gray or malleable Fe foundries. An installation was made in England for melting and partly refining steel in a 10-ton furnace and then transferring approx. $^1/_3$ of the molten bath to a $3^1/_2$-ton furnace for finishing. Several elec. and metallurgical advantages are claimed. The same practice has been tried in this country with satisfactory results. The largest elec. arc furnace thus far installed is a 60-ton Greaves-Etchells furnace. This furnace has 2 charging doors on each side, 1 in the rear, and a teeming spout in the front. All doors are operated by air cylinders. Side-wall linings are 18 in. thick; roof brick 12 in. thick. There are eight 24-in. carbon

electrodes. Transformer equipment consists of four 3,000 kv. a. units, primary 4600 v., secondary 90 to 39 v. Among other developments in the general field, the need for improved electrodes has been met by at least one manufacturer by making electrodes of considerably higher density. Reports indicate better performance and less breakage with such electrodes. L. J. (*C. A.*)

25. Use of refractory materials in gas works. G. M. Gill. *Gas World*, **78,** 416–8; *Engineering*, **115,** 696–8(1923).—England possesses a considerable resource in clay which could be employed to produce semi-silica or siliceous refractory materials not having the disadvantages of either fireclay or 95% silica material. Fireclay often shows too much after-contraction and too ready a tendency to soften under load, while 95% silica material as often shows too much after-expansion, necessitating special construction, besides the extra expense of the retorts having to be built up instead of molded, and the objectionable tendency of 95% silica material to spall. There is large opportunity for the production of a much larger quantity of semi-silica or siliceous material with a SiO_2 content of 76 to 92% according to the position in the setting and the purpose for which it is required. The same class of material might also be used with great advantage for producer arches and walls and for the crowns of the arches in horizontal settings. At least 75% of the material required for building modern retort settings should be of a quality showing not more than 1% max. expansion or contraction at 1350° to 1400° under load, the remaining 25% showing not more than 1% max. expansion or contraction at 1280° under load. J. L. W. (*C. A.*)

26. Comparison of the modulus of rupture of silica bricks, hot and cold. E. C. McGree. *Rev. universelle mines*, **17,** 36–7(1923).—The modulus of rupture (under pressure) at 1350° was approx. $^1/_3$ that at ordinary temp. The decrease in transverse resistance to rupture was approx. inversely proportional to increase in temp. and it is possible to est. the modulus of any brick at high temps. from its value at ordinary temp. Very rapid heating to a red heat reduced the modulus disproportionately. C. C. D. (*C. A.*)

27. Physical chemistry of refractory oxides. Olaf Andersen. *Norg. Geol. Undersökelse*, **1,** 55 pp.(1922).—Summary of recent high-temp. investigations of single refractory oxides and of systems contg. several of these oxides as components. A bibliography is given. J. A. A. (*C. A.*)

28. Norwegian dolomite. Utilization of dolomite. Olaf Holtedahl and Olaf Andersen. *Norg. Geol. Undersökelse*, **2,** 49 pp.(1922).—Deposits of fine-grained dolomite occurring in the northern part of Norway are described. Some preliminary expts. on the "burning" of dolomite have been carried out. The heating of this dolomite for 2–5 hrs. at 1400° produced no effective sintering. The structure of the raw dolomite has no great influence on the structure of the burned product, since, within certain limits, the resulting lime and magnesia were always very fine-grained. The sepn. of lime from raw dolomite by elec. sintering or melting is discussed. J. A. A. (*C. A.*)

Whiteware

29. The production of porcelain for electrical insulation. F. H. Riddle. *J. Am. Inst. Elec. Eng.*, **42,** 343–6, 540–3(1923).—A history of elec. porcelain. It is defined as "an agglomerate of clay and quartz held together in a matrix of molten feldspar." Some typical analyses of the clays used are given. The phys. properties and functions of the raw materials are reviewed. W. E. R. (*C. A.*)

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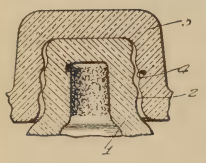
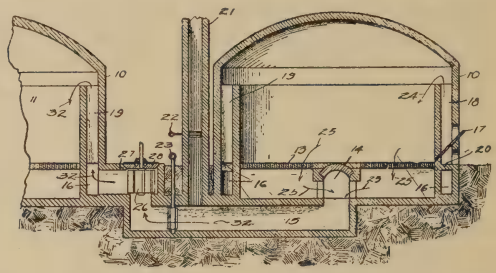
30. Talc porcelain. Kôsuke Hirano. Japan. 40,863, Nov. 30, 1921. A mixt. of 25% talc, 30% talc previously fired at about 1200°, 30% clay or kaolin, 10% feldspar

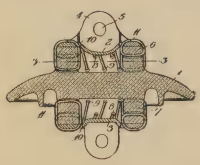
and 5% magnesite, previously fired at 600–1200°, is used. Only one process of heating is sufficient. The addn. of magnesite is specially emphasized. (*C. A.*)



31. Joint for articles of ceramic and similar materials and method of producing same. Arthur O. Austin. U. S. 1,456,960, May 29. In combination, a plurality of ceramic bodies having connection with one another at a plurality of points of limited extent, said bodies being fused to one another at their points of connection to provide a yielding joint. See also *Ceram. Abs.*, **2**,77(1923).

32. System of kilns. Leroy Weeks. U. S. 1,454,358, May 8. A battery of kilns each provided with heating chambers and passageways arranged between the heating chambers and connected together by a subterranean conduit, each of said conduits having an opening in the top wall thereof, a fan element arranged to be selectively and removably received in any one of the conduits between any pair of kilns, so that heated air from one kiln may be drawn into the next adjacent kiln, a bearing member for said fan element arranged to be seated in any of said openings, and when the kiln is at a predetermined heat the fan element and bearing member may be removed for the purposes stated.





33. Insulator. Walter T. Goddard. U. S. 1,454,634, May 8. An insulating unit comprising an element formed of frangible insulating material, a rigid metallic element connected thereto, and means for connecting said elements at a plurality of points and for equalizing the strains imparted from one of said elements to the other, said means involving a continuous flexible sinuous member alternately engaging the said connected elements at a succession of points on each of said elements.

34. Porcelain tank and process of making the same. Charles J. Kirk and George Brain. U. S. 1,449,761, Mar. 27. The process of casting porcelain tanks having corners that comprises pouring liquid slip into a suitable mold, permitting the porcelain to set until the side walls of the tank have solidified, piercing one or more of the corners to permit the escape of unsolidified slip and draining off the unsolidified slip.

35. Process and mold for forming earthenware articles and product thereof. Charles J. Kirk and George Brain. U. S. 1,449,762, Mar. 27. The process of forming a closet of cast earthenware which comprises providing a siphon member forming the top of the discharge arm of the siphon and the bottom of the intake arm of the siphon, the said member having the intake siphon portion supported throughout its length upon said discharge portion by means of a solid web, placing the said siphon member in a mold, forming the exterior of the closet bowl, and casting the said siphon member within the closet.

36. Nonslip tile. Abraham Albert Klein and Milton F. Beecher. U. S. 1,451,462, Apr. 10. A non-slip tile comprising wear-resisting abrasive granular material of a hardness between quartz and crystalline alumina and a ceramic bonding material integrally united by heat into an abrasive, wear-resisting and substantially integral mass in which the granular material constitutes a substantial proportion of the surface

of the tile and the bond is capable of permitting renewal of the safety characteristics of the tread surface.

Equipment and Apparatus

37. A new form of precision hydrometer. C. W. Foulk. *J. Optical Soc. Am.*, **7**, 327–34(1923).—The principle of the app. is that of submerged floating equil., in which an elongated hollow glass or silica bulb is ballasted so that it neither rises nor sinks in a given liquid. One type of app. consists of a tube open at both ends and of the right diam. to allow the float to move freely along its length, the appropriate scale being etched on the side wall of the tube. To the bottom of the float is attached a small chain hanging in a catenary curve between the float and an independent pt. of support. When the app. is put into a liquid the float takes up a position detd. by the d. of the liquid while the suspended chain automatically adjusts the wt. to that d. The effect of various consts. of the above float on response to differences of liquid d. is shown by the equation: $\Delta d = w[(D—d) \times \Delta b]/(2D \times V)$, in which Δd = density change in liquid causing vertical displacement of float of Δb measured in cm., D = density of chain material, d = density of liquid, V = vol. of float in cc. and w = wt. in g. of 2 cm. of chain. The formula shows the sensitiveness of the instrument to be proportional to the vol. of the float and inversely proportional to the wt. of a unit length of chain. Advantages over old types are: more accurate scale reading, absence of troublesome surface phenomena and uniform temp. Some disadvantages are given. H. E. B. (*C. A.*)

38. The improved MacMichael viscosimeter. W. H. Herschel. *J. Optical Soc. Am.*, **7**, 335–53(1923).—The app. is a const.-deflection, torsional instrument, with advantage of speed of operation, and weakness due to variations in torsional resistance of suspending wire. It consists of a torsional pendulum with a bob hanging in the liquid to be tested. On a turntable is an outer cup concentric with the cup holding the test liquid, and the space between contains oil or H_2O with an elec. resistance coil for heating. The turntable moves at const. speed and the pendulum has const. deflection during the test, due to the viscous drag of the liquid. The deflection is read on a horizontal dial concentric with the bob by means of a telescope, and the circumference is divided into 300 equal parts, called the MacMichael degrees. Two bobs are supplied, one similar to the disk formerly used and the other a cylinder 1 cm. in diam. and 4 cm. high. Various methods are described for avoiding end effects, including the use of guard rings on the inner suspended cylinder and trapping of an air bubble under the bob. Turbulence is caused by too wide a clearance and an equation is given for estg. the crit. velocity at which it begins. Imperfect elasticity of the torsional wire is the cause of considerable error and several tables are given showing allowable deflections and variation in torsional modulus of elasticity with diam. of wire. Tables and equations are also given to show the measurement of turning moments on the suspended wires, the variation of dial readings with change of viscosity and wire diam., and detn. of deflection by mirror and scale method. The conclusions reached are, that the wires of the improved MacMichael viscosimeter cannot be calibrated with H_2O because of turbulence, a liquid with viscosity of about 0.5 poise being required. The end effects are negligible compared to errors due to semi-permanent set of the torsion wires. The app. might be greatly improved by measuring the moment due to viscous drag by other means than the torsion wire. H. E. B. (*C. A.*)

39. Viscosimeter. E. Stern. *Chem.-Ztg.*, **47**, 291–2(1923).—The app. is useful in comparison work on *colloids*, such as *varnishes*, solns. of *cellulose*, *rubber adhesives*, etc., as well as in the *oil* industry. It consists of 3 cylindrical glass bulbs, the middle one contg. 75 cc. between marks on the stems joining it to the others. The upper bulb is open at the top while the lower terminates in a tube to which capillary tubes of different

lengths and diams. may be attached in order to change the rate of discharge. A H_2O-jacket is provided for work at const. temp. J. H. M. (*C. A.*)

40. A laboratory optical pyrometer: notes on its design and operation. Wm. Schriever. *Proc. Iowa Acad. Sci.*, **28**, 69–82(1921).—An optical pyrometer suitable for accurate temp. detns. and flexible enough to be of general use in a physical lab. is described with illustrations. A brief sketch of the theory and design of a Holborn-Kurlbaum optical pyrometer is included (cf. *C. A.* **16**, 4097). W. G. G. (*C. A.*)

41. A thermoelement for radiation measurements. Rudolf Hase. *Z. Physik.*, **15**, 52–3(1923).—A short piece of an alloy which will give a very high thermoelec. force is welded to suitable leads and placed in a thin-walled, highly evacuated glass bulb. The black collecting disk is fastened to the "hot junction" and the cold junction is in the shadow of the disk. A novel mounting of the thermoelement and galvanometer cuts out all extraneous radiation and the scale, which is calibrated to read the black-body temp. directly, is illuminated by the radiating body. The instrument is suitable for measuring all temps. above 500°. C. C. V. V. (*C. A.*)

42. Laboratory apparatus for heating at high temperatures. Georges Chaudron and M. Garvin. *Chimie et industrie*, **9**, 647–50(1923).—Brief description of the Tammann, Arsen, and Ruff furnaces. C. and G. designed a vacuum furnace for high temps., consisting essentially in a double-walled metal body in 3 sections: base, contg. suction, gas, electricity and water connections; body proper and cover. Water can be circulated through the 3 portions. Heating is obtained by means of an internally wound W coil, which can be heated 8 times up to 2000° before wearing out. A vacuum of 0.001 mm. can be obtained cold and 0.02 mm. hot. An app. for winding the W coils is described. A. P. C. (*C. A.*)

43. Improvement in crusher steel is suggested by metallographic tests. O. E. Harder. *Eng. Mining J. Press*, **115**, 314–8(1923).—Examn. of failures of mine and mill equipment indicates that sufficient attention is not given to heat-treatment in the process of manuf. V. O. H. (*C. A.*)

44. Safety locking device for filter press. W. J. Tait. *Eng. Mining J.-Press*, **115**, 938(1923).—An illustrated description of a device to prevent opening of a filter press head while under internal pressure. It consists of a diaphragm and plunger operating 2 safety catches held down over the locking yoke. C. C. D. (*C. A.*)

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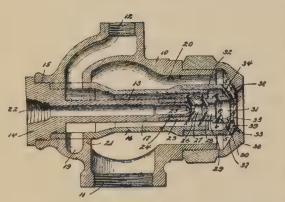
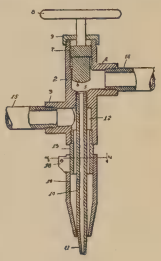
45. Burner. Alfred R. Anthony. U. S. 1,451,063, Apr. 10. An oil burner including in combination, a body, a fuel tube therein said tube having a chamber at its forward end open at the tip of the tube and said tube also having an aperture for discharging a jet into said chamber, the wall of the fuel tube surrounding the chamber having a plurality of series of holes therethrough spaced along the length of the chamber, each series comprising a plurality of holes spaced circumferentially of the wall one series being inclined forwardly toward the axis of the chamber and one series being inclined in a circumferential direction to discharge the air into the chamber with a whirling motion.

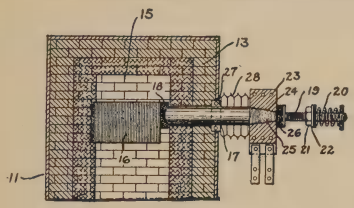


46. Oil burner. Frank J. Atkins. U. S. 1,452,020, Apr. 17. In a burner of the class described, a tubular main body provided with a pair of lateral extensions at opposite sides thereof communicating with its interior, said body having an enlarged chamber at its rear, a valve seated in said chamber, a cap threaded on the valved end of said body, an oil tube extending forwardly and threaded into the burner body and in communication with said chamber, said tube being contracted at its outer end to form a

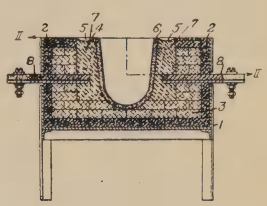
nozzle, said body having an enlarged chamber in front of the connection with the oil tube with the body, said chamber being cut off from communication with the first-mentioned chamber and from the tube, a tubular connecting sleeve threaded into the front end of the second mentioned chamber and encircling the oil nozzle tube, the bore of said connecting member being a larger diameter than the tube providing a chamber communicating with the second mentioned chamber, and a tubular air nozzle adjustably secured around and encircling the oil nozzle tube, said air nozzle being contracted at its front end adjacent the base or inner end of the contracted portion of the oil nozzle, the air nozzle being adjustably mounted on the sleeve connection whereby the outlet end of the air nozzle will at all times be positioned at the rear of the outer end of the oil nozzle.

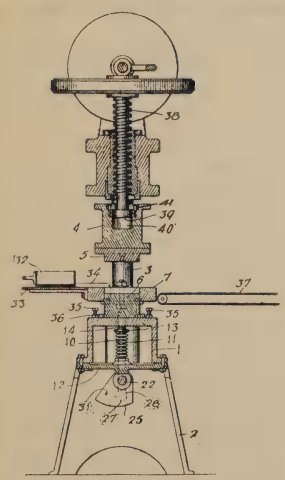


47. Terminal for electric furnaces. PORTER H. BRACE. U. S. 1,456,865. In an electric-resistance furnace, the combination with a movable electrode and a stationary water-cooled collar surrounding said electrode, of a movable water-cooled terminal secured to one end of said electrode and an expansible metal tubular member secured to said collar and said terminal for preventing the escape of a heated fluid leaking past said collar and for equalizing the temperatures of said collar and said terminal.



48. Electric furnace. CRANSTON H. CARPENTER. U. S. 1,444,948. In an elec. furnace, the combination with a refractory casing, of a muffle of refractory electrical-conducting material in said casing, hoppers in said casing on opposite sides of said muffle, solid carbonaceous terminal electrodes extending into said hoppers, and a mass of electrical-conducting granular material in each of said hoppers adapted to electrically connect said electrodes and said muffle and to permit the current to traverse the walls of said muffle, said masses of granular material being in contact with said muffle over a relatively small portion of its surface.





49. Power tile press. EDMUND W. ZEH. U. S. 1,456,752, May 29. In a power tile press, the combination of a lower die to receive the material of which the tile is to be formed, an upper die adapted to coöperate with said lower die to compress the material, operating means for moving the upper die into and out of contact with material in the lower die, and means for enabling successive percutient blows to be struck upon the material while the dies are in contact therewith.

50. Crushing machine. GEORGE HOLT FRASER. U. S. 1,451,149, Apr. 10. In combination, an annular die revolving in an approximately vertical plane and having an internal crushing face, a movable and rotatable crushing roll within and eccentric of said die and having a peripheral crushing face reciprocal to the inner face of said die, means for revolving one of said parts, a

casing supporting said parts, a movable member movably mounted on said casing, non-rotative movable means on which said roll is rotatably mounted and movably mounted on and held outwardly by said movable member, and pressing means opposite and reacting on said movable member and said casing for holding said non-rotative means outwardly to hold said roll outwardly toward the inner face of said die to resist a crushing pressure therefrom.

51. Machine for crushing or grinding. GEORGE H. FRASER. U. S. 1,451,150, Apr. 10.

52. Machine for crushing or grinding. GEORGE H. FRASER. U. S. 1,451,151, Apr. 10.

53. Pulverizing mill. GEORGE H. FRASER. U. S. 1,451,152, Apr. 10.

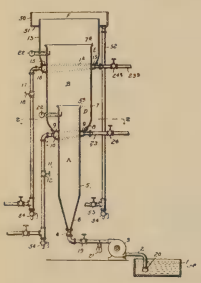
54. Pulverizing mill. GEORGE H. FRASER. U. S. 1,451,153, Apr. 10.

55. Machine for grinding and crushing. GEORGE H. FRASER. U. S. 1,451,154, Apr. 10.

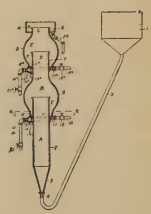
56. Machine for crushing or grinding. GEORGE H. FRASER. U. S. 1,451,155, Apr. 10.

57. Machine for crushing and grinding. GEORGE H. FRASER. U. S. 1,451,156, Apr. 10.

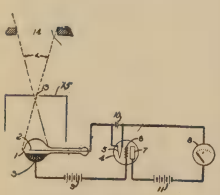
58. Method of separating granular solid materials. MARTIN HOKANSON. U. S. 1,449,603, Mar. 27. The method of separating solid materials of different specific gravities or sizes, which consists in subjecting the material to an upwardly flowing stream of water of such diameter relative to its velocity as to cause the heavier particles to move radially to the outside of the stream and the lighter particles to remain inwardly thereof, continuing such flow until the particles of a given grade have moved to the outside of the stream, and continuously withdrawing such material and water uniformly around the stream.



59. Apparatus for separating solid materials of different specific gravities. MARTIN HOKANSON. U. S. 1,449,604, Mar. 27. Apparatus for separating solid granular materials, comprising a vertical vessel, means for forcing the materials in a finely divided form mixed with water upwardly through said vessel, said vessel intermediate its height being provided with a portion of increasing diameter providing an annular chamber in which the solids are deposited by radial separation from the vertical stream, said annular enlargement being provided with a series of outlets uniformly spaced around said vessel, an annular chamber receiving from said discharge openings, said annular chamber being of progressively increasing dimensions from one side, and a controllable outlet from the largest point of said drawn-off chamber.

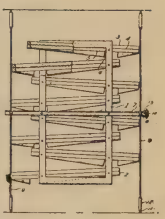


60. High-temperature measurement. HERBERT E. IVES. U. S. 1,449,512. A device for measuring the temperature of a highly heated body comprising a photo-electric cell for translating radiant energy into electrical energy, a perforated diaphragm at a fixed distance between said cell and the highly heated body, the perforation in said diaphragm subtending a solid angle from all parts of the cell smaller than that subtended by the highly heated body, a vacuum tube for amplifying the current of said electrical energy, and means for registering the amplified current.



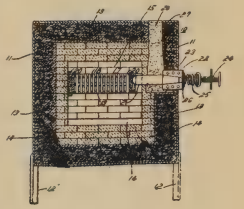
61. High-frequency screen. HARRY H. KELLER. U. S. 1,446,298, Feb. 20. A multiple deck screen, a tensioned supporting means arranged for unitary action and

a disturbing force for said means to cause the screen to move as a unit with a true rectilinear motion.

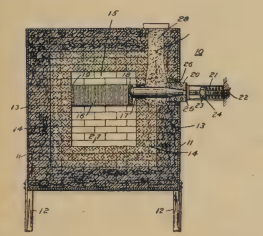


62. Electric resistance furnace. GEORGE M. LITTLE. U. S. 1,456,890, May 29. An elec. fur. comprising a metal container, a metal cover for said container, a metal base plate secured to and insulated from said container, means for attaching elec. supply circuit terminals to said container, granular resistor material surrounding said crucible and means in said cover for compressing said resistor material in said container.

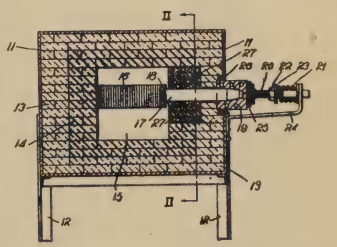
63. Electric furnace resistor. GEORGE M. LITTLE. U. S. 1,456,891, May 29. An elec.-resistance fur. comprising a built-up resistor consisting of single flat carbonaceous plates of relatively large area of cross-section alternating consecutively with a plurality of flat carbonaceous plates of relatively small area of cross section, the area of cross-section of the small plates being in accordance with the kw. input of the fur.

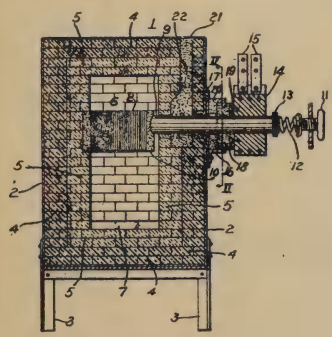


64. Protected electrode for electric furnaces. GEORGE M. LITTLE. U. S. 1,456,892, May 29. An electric furnace comprising a plurality of furnace walls, an electrode extending horizontally through one of said walls and movable relatively thereto during operation of the furnace, a well in said wall, a quickly renewable granular oxidizable barrier in said wall surrounding said electrode over a portion of its length intermediate its ends, said barrier being adapted to prevent chemical action of entering air upon said electrode but permitting free movement of said electrode relatively to said wall.



65. Electric-furnace wall construction. GEORGE M. LITTLE. U. S. 1,456,893, May 29. An electric furnace comprising a plurality of walls enclosing a furnace chamber, a resistor located in said chamber and supported at one end thereof by one of said walls, a plurality of electrodes operatively engaging said resistor to conduct current to and from said resistor, and means for reducing the current leakage between and from said electrodes said means comprising a plurality of spaced-apart refractory members surrounding said electrodes intermediate their ends and having only a relatively small area of surface contact between adjacent plates.

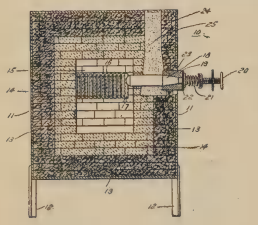




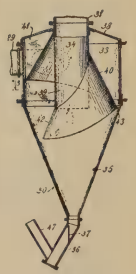
66. Telescoping electrode protector. GEORGE M. LITTLE. U. S. 1,456,894, May 29. An electric furnace comprising a plurality of furnace walls enclosing a furnace chamber, a resistor in said chamber, a carbonaceous electrode extending through one of said walls

for conducting current to and from said resistor and having limited longitudinal movement relatively to said wall, a water-cooled terminal mounted on said electrode at its outer end, granular oxidizable material surrounding said electrode between said wall and said terminal and a two part telescoping container for said granular material, one part being secured to said wall and the other part being located against said terminal.

67. Electric-furnace resistor. ORA A. COLBY. U. S. 1,448,388, Mar. 13. In an elec. fur., the combination with a plurality of walls surrounding a fur. chamber, of a resistor in said chamber comprising a plurality of dished refractory elec.-conducting members, granular resistor material in each of said dished refractory members and resilient means for maintaining said dished members in interlocked position in said furnace chamber free of said walls.

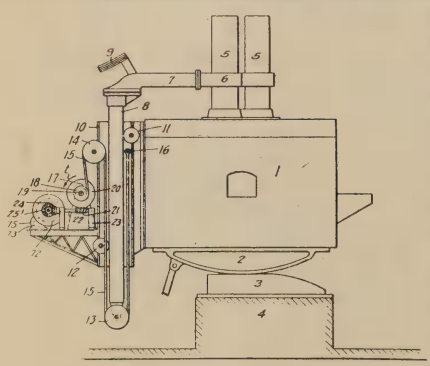


68. Separator. HARRY RAYMOND COLLINS. U. S. 1,444,585, Feb. 6. A separator comprising a cylindrical casing provided near its upper end with a port through which a current of air laden with material may enter the separator and at its lower end with a discharge chute, a cylindrical relief pipe within the casing, and a downwardly flaring spiral member attached to the relief pipe along a line of progressively varying pitch to provide a spiral chamber of gradually increasing volume above the member.



69. Method of making anhydrous magnesium chloride. PAUL COTTRINGER AND WILLIAM R. COLLINGS. U. S. 1,450,912, Apr. 10. The method of making anhydrous magnesium chloride which consists in causing a reaction between magnesium oxide and hydrochloric acid gas, substantially as described.

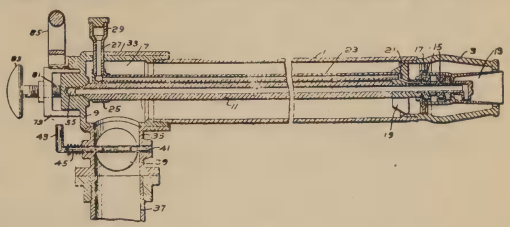
70. Apparatus for moving furnace electrodes. WALDEMAR DYRSSEN. U. S. 1,450,668, Apr. 3. An elec. fur. having a movable electrode, a motor rotating continuously in one direction at a substantially constant speed, a shaft connected by differential gearing to said motor for moving said electrode, and means operatively connected with said differential gearing for controlling the rate of rotation of said shaft.



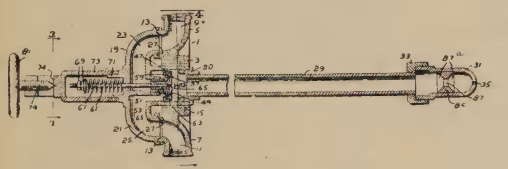
71. Liquid-fuel burner. MILTON A. FESLER. U. S. 1,445,826, Feb. 20. A liquid fuel burner, comprising, in combination, a steam conducting tube, an oil conducting tube mounted in said steam conducting tube, a delivery head communicating with said tubes, a single valve for automatically controlling the discharge of steam and oil from said tubes into said head, a stem for said valve projecting through the oil conducting tube, and a coil spring coöperating with said stem to close said valve, but yieldable in response to steam pressure on the valve to allow the latter to open.

72. Burner. MILTON A. FESLER. U. S. 1,445,827, Feb. 20. The combination

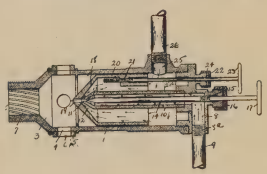
with a support, of a burner movably mounted thereon and having fuel and fluid conducting passages leading to the delivery end of said burner, and a device adapted to lock the burner in the support and to admit fuel to the burner when in one position and adapted to unlock the burner from the support, to cut off the fuel supply and to admit fluid to the fuel passage to drive residual fuel therefrom when in a different position.



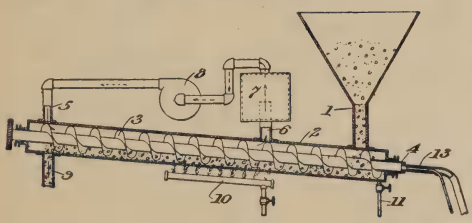
73. Burner. MILTON A. FESLER. U. S. 1,445,828, Feb. 20. In a fuel oil burner, the combination of a casing provided with a delivery office, a mixing chamber located remotely from said orifice, a long conduit extending from said chamber to said orifice, and oil and steam passages leading to said mixing chamber; a valve seat adjacent the delivery ends of the oil and steam passages, and a spring-pressed valve for closing both said passages.

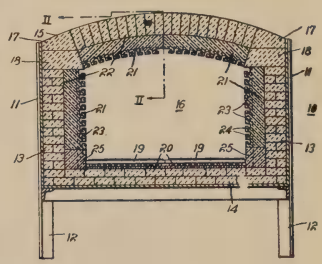


74. Fluid-fuel burner. PAUL B. NORRIS. U. S. 1,446,514, Feb. 27. In a fluid fuel burner, the combination of a body; an atomizing nozzle slidingly mounted in the body and having a nozzle opening with a tapered interior wall extending therefrom; a screw operating in the atomizing nozzle; a stem on the screw locked against axial movement relatively to the body, the screw being adapted to adjust the atomizing nozzle axially of the body; and a contracted fuel nozzle discharging into the atomizing nozzle, said fuel nozzle being placed to the rear of and in alignment with the atomizing nozzle.



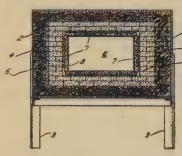
75. Process of and apparatus for heating materials. CHARLES J. REED. U. S. 1,447,888, Mar. 16. In an app. for the heat-treatment of solid material an inclined tubular chamber, one portion of which is maintained at a higher temperature than other portions, in combination with means for causing the solid material to move through the chamber in a specific direction from a lower to a higher level into and out of the heated portion, and means for simultaneously causing mobile material to move through the chamber in the opposite direction.





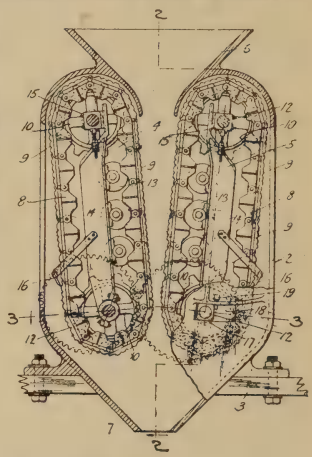
76. Electric furnace. THOMAS A. REID. U. S. 1,444,939, Feb. 13. An elec. heating element for a fur. chamber defined by refractory walls comprising a plurality of spaced-apart relatively narrow, elongated refractory members extending beyond the inner surface of said walls into said chamber each having a plurality of spaced apart transversely extending slots of substantially L-shape adjacent to

the inner surface thereof, and a plurality of end-connected convolutions of relatively heavy and selfsupporting-resistor material located in said slots and extending openly between said refractory members.

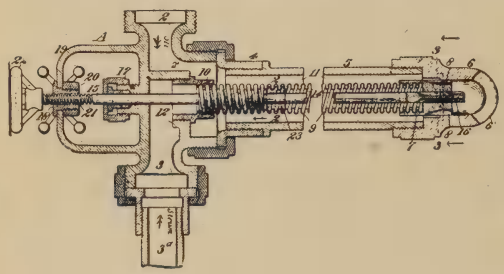


77. Resistor-supporting means. THOMAS A. REID. U. S. 1,444,940, Feb. 13. An elec. resistor supporting means comprising a refractory member having a plurality of rows of relatively small recesses in one surface thereof, the recesses being operatively aligned in two directions.

78. Crushing and grinding machine. JAMES A. WARREN. U. S. 1,448,013, Mar. 16. A crushing and grinding machine comprising a pair of downwardly converging endless belts one of which is mounted to swing outwardly with relation to the other, and means to yieldingly hold the movable belt in its normal position.



79. Burner. CARLYLE J. SHERWOOD. U. S. 1,455,175, May 15. In a device of the character described, a casing, a corrugated tube within said casing, means for securing one end of the tube, means for delivering a liquid under pressure to the interior of the tube, and means for delivering a separate liquid under pressure to the casing, and a valve member secured to the end of the tube operable for simultaneously decreasing or increasing the flow of a liquid from the tube and casing.



Kilns, Furnaces, Fuels and Combustion

80. Ceramic furnaces. Forced draught versus natural draught. ANON. *Brit. Clayworker*, **32**, 71(1923).—Forced vs. natural draught in ceramic fur. was the subject of discussion (May 14) at the Technical congress of the ceramic industry held in Paris. M. Denisse discussed the advantages and disadvantages of the various furnaces and compared the tunnel and continuous ovens, and showed that the use of the fan increased production by 25%. He concluded that a fan, whether employed for drying or for firing, was a valuable aid to the ceramic industry. M. Norray defended the natural draught, in particular he claimed that the use of forced draught was useless in connection with Hoffman ovens, and that it would be wrong to use it in every case. M. Granger, chief of the Testing Laboratory of the Sévres porcelain factory, described improvements in the manuf. of plates, and gave an account of modern plant processes.

O. P. R. O.

81. Surface combustion with special reference to recent developments in radiophragm heating. W. A. BONE. *Gas J.*, **162**, 423–8(1923); *Gas World*, **78**, 405–9; cf. *C. A.*, **8**, 3358; **16**, 2021.—It has been proved previously that: According to their chem. nature and physical texture all hot surfaces, at temps. below ignition point, have the power of accelerating gaseous combustion in different degrees; at high temps. this difference in power of acceleration practically disappears; during combustion the chem.

action occurs mainly in, and is usually confined to, the boundary layers between the gaseous and solid phases; the accelerating influence rapidly increases with rise in temp.; and all surface combustion depends upon the absorption of the combustible gas, and probably the O by the surface, thereby becoming activated through assoc. with the surface. These discoveries were applied to industrial purposes and in particular to an installation of 2 boilers at the Skinningrove Iron Works fired on this principle with coke-oven gas (cf. *C. A.* **8,** 1863). A radiophragm was devised which consisted of a porous diaphragm of refractory material through which was forced a homogeneous mixt. of gas and air in the right proportions for complete combustion. This mixt. was burned at the front face of the diaphragm without flame, and maintained the surface there in a state of incandescence. Unfortunately, the radiophragm proved difficult to manuf. and possessed the disadvantage of pre-ignition when working at a temp. above 900°. Recent improvements have been made which have entirely eliminated this risk of backfiring even at much higher temps. The new radiophragms are being made in both flat and circular forms and are finding a wide variety of industrial applications, such as baking, cooking, metal-melting, water-heating, etc. The great advantage lies in the possibility of consuming large vols. of gas within a very limited space with the attainment of very high temps. and without the use of regenerators of a waste of gas. J. L. W. (*C. A.*)

PATENTS

82. Burner. FRANCIS H. BROWN. U. S. 1,451,812, Apr. 17. A burner comprising in combination, a body having a delivery tip provided with an orifice, means for conducting the oil and atomizing fluid to the body and for atomizing the oil as it is delivered to the body, and a secondary atomizing means located within the body between the first atomizing means and said tip and comprising a pair of adjustable nozzles one within the other.

83. Brick or tile for furnace construction. CHARLES F. BINNS. U. S. 1,456,498, May 29. An article of manufacture comprising a brick for wall construction, said brick having flat top and bottom faces coextensive with the length and breadth of the brick and parallel aligned end faces, and a laterally offset portion intermediate of the end faces.

Geology

84. Titanium. Canada. A. H. A. ROBINSON. Can. Dept. of Mines, *Rept.*, (1922).—A very useful and complete report of 119 pages on "Titanium" discusses the manuf. properties and uses of this pigment, as well as those of other useful titanium compounds and describes in detail the occurrence in Canada of large unexploited deposits of titanium ores that may in future become of great industrial importance.
O. P. R. O.

85. Magnesite deposits of Grenville, Quebec. G. W. BAIN. *Trans. Am. Inst. Mining Met. Eng.*, No. **1244M,** 19 pp.(1923).—Magnesite and dolomite, both mineral and rock, occur in the Grenville limestone associated with gneisses and dikes. The deposits are found only beneath impervious dikes and on or near the crests of anticlines. They were probably formed by replacement, by means of hot Mg-bearing waters from a granite magma. E. F. H. (*C. A.*)

86. Report on Texas alkali lakes. C. C. MEIGS, H. P. BASSETT AND G. B. SLAUGH-

TER. Univ. of Texas, *Bull.*, No. **2234,** 59 pp.(1922).—Other K deposits of the country are critically reviewed. The brines described are in Lynn, Terry, Hockley, Lamb, Bailey and Cochram Cos. The "lakes" are depressions formed by the removal, by soln., of salt beds from underlying Permian beds. They are filled with silt containing brine and salt crystals, fed by springs coming from the Permian strata. Salt, K, and Mg are the valuable constituents of the brines. A large number of analyses and logs of wells are given. Much of the paper consists of recommendations for the process to be used, and cost ests. E. F. H. (*C. A.*)

Chemistry and Physics

87. Vapor pressure of arsenic. Determination of the vapor pressure of metallic arsenic. SHINKICHI HOSIBA. *Konin Klijke Akad. Van Wetenschappen Amsterdam Proceedings,* **25,** 387–94(1923).—The vapor pressure of gray arsenic in the solid and liquid phases was detd. and the data given in tabular form. The m. p. of gray arsenic is given as 817–18° at a pressure of 35.8 atm. W. M. C.

88. French potash industry. M. MENNECKE. *Chem. Age.,* **8,** 672.—The Alsatian potash deposit consists exclusively of silvinite, (KCl and NaCl), or mineral salt. The method of extraction is by drilling and the use of explosives. The raw salts are delivered for agricultural purposes or are refined in the chem. works to 80 or 98% muriate of potash and used for the manuf. of sulphate of potash. O. P. R. O.

89. Plasticity of ceramic materials. BIGOT. *Brit. Clayworker,* **32,** 71(1923).—The plasticity of ceramic materials was considered by Dr. Bigot at the Technical congress of the ceramic industry, Paris, May 15; he said that colloidal plasticity was of vital importance in ceramics, he described methods of measuring it, the variations it underwent during pressure and firing, and pointed out that processes of rapid manufacture should be preceded by lab. studies on plasticity. O. P. R. O.

90. Ceramic products: degree of firing ascertained by microscope. L. BERTRAND. *Brit. Clayworker,* **32,** 71(1923).—The compn. and structure of various claps and the change they undergo on heating, was discussed by L. Bertrand, of the École Normale Supérieure, at the Technical congress of the ceramic industry, Paris, May 15. Methods of microscopical examn. were described, and it was shown how these could be used to give results with a precision unobtainable by chem. analysis; for instance, a microscope made it possible to ascertain the degree of firing of certain delicate ceramic products. O. P. R. O.

91. Tantalum and its technical uses. S. L. MALOWAN. *Edel Erden u. Erze,* **4,** 26–8(1923).—After a brief history of the discovery and first isolation of the metal, the method of reduction and uses are given. The high m. p. of Ta makes it adaptable for light bulbs in place of W; the life of these lamps is about 1,000 hrs. The metal is also used for instruments in the medical and dental professions because of its hardness and resistance to common acids. W. A. M. (*C. A.*)

92. Calcium aluminium silicate and zeolite question. ST. REINER. *Zement,* **12,** 49–51, 55–7, 65–6(1923).—A review and criticism of previous work on zeolites. R. F. S. (*C. A.*)

93. The constitution of the silicates. G. TAMMANN. *Z. anorg. allgem. Chem.,* **125,** 301–6(1922).—T. finds that the mol. sp. heats of the silicates are additive, and concludes that the mols. are independent and at temps. far removed from their m. p. do not vibrate appreciably. This conclusion is supported by the fact that only in the neighborhood of the m. p. do isomorphous complex substances diffuse into one another visibly. In soln., silicates undergo hydrolysis, and this therefore gives no definite information as to the mols. which exist in the solid. The structure of molten silicates cannot be investigated. The complex silicates differ from the C compds. in that they are decomposed in soln. and in the fused state, and the mol. theory of org. chemistry finds no application in the chemistry of silicates. J. C. S.

94. A practical procedure for the analysis of bauxite. G. CASTELLI. *Rass. min. met. chim.*, **58,** 62–5(1923).—The standard procedure of English metallurgical labs. for detg. H_2O, ignition loss, SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, K_2O, Na_2O, P and S is given with typical *analyses of bauxite* from several countries. C. C. D. (*C. A.*)

95. High-temperature investigation. E. F. NORTHRUP. *J. Franklin Inst.*, **195,** 665–86(1923).—A comprehensive account is given of the methods and technic used in the study of matter at high temp. free from chem. contamination, with special reference to the *high-frequency induction furnace.* J. S. H. (*C. A.*)

96. Rapid technical estimation of iron oxide and alumina in clays and in their products. FERNANDO LUCCHESI. *Giorn. chim. ind. applicata,* **5,** 12–4(1922).—Carefully wash the fresh ppt. of the hydroxides of Fe and Al obtained in the usual way until no more chlorides are found in the filtrate. Place filter and contents in a beaker and add from a buret a known excess of 0.5 *N* H_2SO_4 (50 cc. of the acid for each g. material taken for analysis). Boil for about 10 min. Cool, add 2 drops of 0.02% Me orange, and titrate with 0.5 *N* NaOH until the red hue disappears. (Use for comparison an equal vol. of acidulated H_2O colored with 2 drops of Me orange.) Do not continue toward the yellow, but stop at the point of change. Calc. by difference the acid combined with the 2 oxides. Add to the soln. 1 cc. concd. H_2SO_4, reduce with H_2S and in the same beaker est. the Fe with 0.1 *N* $KMnO_4$. The filter paper present does not appreciably affect the results, which are satisfactory, with the advantage of very rapid execution. R. S. P. (*C. A.*)

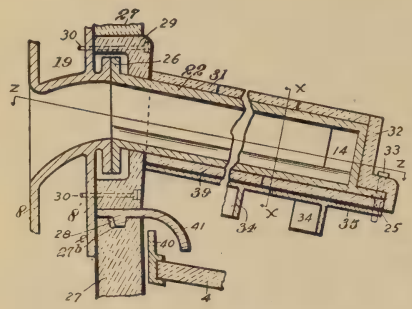
97. Laws of crushing. J. HERMAN. *Eng. Mining J. Press,* **115,** 498–9(1923).—Tests on a wide variety of materials, with a screen discharge ball mill, are presented as curves; energy input *vs.* mesh of product with *Kick's* and *Rittinger's* laws are also shown graphically for comparison. The results are more in accord with Rittinger's law, particularly when the grinding is efficiently done. This law represents the min. power required, Kick's the max. Results on tough materials approach the latter law especially when the reduction ratio is small. The error in applying Kick's law to crushing lies in assuming immediate release of pressure after initial fracture and in failing to consider the energy remaining after this initial fracture which does further crushing work. Rittinger's law also applies to sawing, planing, filing, boring, chiseling, scouring, peeling and gouging. C. C. H. (*C. A.*)

General

98. Oil fuel for clay drying. ANON. *Chem. Age,* (China Clay Trade Rev. Sec.), **8,** 10(1923).—An interesting, illustrated article dealing with a new method of drying clay, giving an account of the expts. carried out for over 6 months with Shell-Mex oil fuel at Great Hallaze China Clay Co. dry at Par, Cornwall. The drying capacity with oil fuel is 156% over that of coal, and the drying cost 93 d. per T. of clay dried compared with 102.58 d. in the case of coal. The clay can be placed on the pan in a very much thinner condition and can be dried very much more quickly without in any way affecting the quality. Transportation costs are slight compared with those of coal, it being possible to pump supplies from the oil reservoir to wherever it is required at a very slight cost. Labor costs are lower, and the cost of the upkeep of the furnace is practically nil with the use of oil. The app. necessary can be easily adapted to the existing coal furnaces. O. P. R. O.

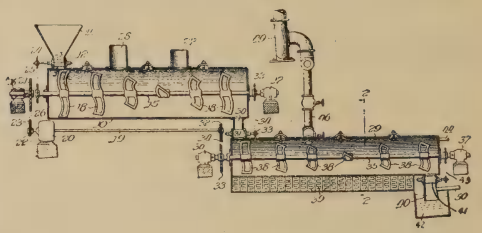
99. Synthetic precious stones. R. QUENSEL. *Geol. För. Förh.*, **44,** 667–9(1922).—*Synthetic rubies* and *synthetic sapphires* have been successfully made from powd. Al_2O_3 in the O-H flame. Coloring agents are discussed. W. S. (*C. A.*)

100. Ore-roasting furnace. ROBERT D. PIKE. U. S. 1,444,209. An app. for the described purpose, the same comprising an outer stationary shell, a vertical rotary

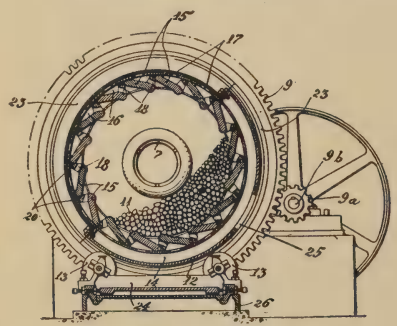


shaft centrally disposed within said shell, a plurality of spaced horizontally disposed hearths arranged within the shell, each hearth provided with outlets for the escape of material therefrom, a series of hollow rabble arms secured and carried by the rotary shaft, means for causing a circulation of a cooling medium through said rabble arms, and a covering of refractory and insulating material for each of said rabble arms.

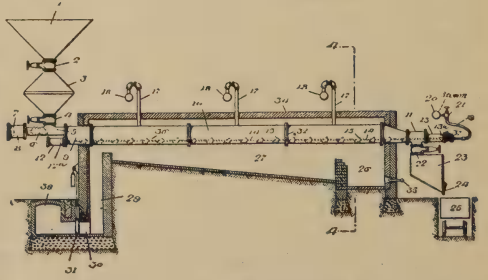
101. Process of treating shale. STEPHAN MARKO. U. S. 1,451,367, Apr. 10. A process of producing combustible gas from oil-bearing shale, consisting in agitating ground shale in the presence of dry heated gaseous products of combustion at temperatures in excess of 600 degrees F, passing the heated shale and gases to a secondary zone of treatment and there continuously agitating the shale and subjecting it to increased temperatures and adding sufficient quantities of superheated steam to the secondary stage of treatment to increase to a predetermined amount the hydrogen content of the evolved gases, separately withdrawing the gas and shale residue from the secondary stage of treatment.



102. Pulverizing mill. RALPH E. H. POMEROY. U. S. 1,451,472, Apr. 10. In a pulverizing apparatus, the combination of a rotatable shell having perforations in its periphery and having therein loose tumbling devices for assisting in grinding the material, means for supplying a current of air inward through said perforations, and adjustable means for shifting said air supply relative to the shell so as to be admitted to different portions of the shell.



103. Oil-shale retort. GEORGE EDWARD HOLMES. U. S. 1,451,575, Apr. 10. Apparatus for distilling oil shale, comprising a heating furnace, a closed horizontal retort, extending through such furnace and subjected to graduated external heat; means for admitting shale into the cooler end of said retort; reciprocating means for stirring the shale when said means moves in one direction and to move the shale along the bottom of the retort in the other direction; means for drawing off distilled products progressively along said retort; means to inject low pressure steam through the agitating means along the bottom of the retort while the shale is in process of distillation; and means for discharging the spent shale at the hottest end of the retort, substantially as described.



CERAMIC ABSTRACTS

Compiled by the

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[1] The abbreviation (*C. A.*) at the end of an abstract indicates that the abstract was secured from the Editor of *Chemical Abstracts* by coöperative agreement.

Abrasives

1. Emery industry (Greece). ANON. *Chemistry and Ind.*, **42**, 594(1923).—It is reported that the Greek Govt. will construct works to facilitate mining and transportation of emery ore, which should increase annual production to approx. 20,000 T. O. P. R. O.

2. Production of bauxite in 1922. *Brick and Clay Rec.*, **62**, 978(1923).—Ark. furnished 266,799 T. and Ga., 30,417 T. of the 309,600 T. of bauxite produced in U. S. in 1922. Statistics given for production and consumption in U. S. including imports and exports for 1921 and 1922. J. W. H.

3. Dissociating bauxite, laterite, and argillaceous substances. ANON. *Oil and Colour Trades Jour.*, **63**, 1870(1923).—According to a recent Ger. patent dissocn. is carried out as follows: The raw material is heated to dull redness, the alumina is then dissolved (for the most part) with dilute nitric acid, leaving most of the iron oxides and silica behind. After sepg. the latter, the soln. is treated in the usual manner. The heating should be carried on in a reducing atm. to reduce the iron to the ferrous state, and thus render it insol. in the dil. acid. The latter may be replaced by nitrous fumes and water. O. P. R. O.

Cement, Lime and Plaster

4. Drying of plaster and its conservation in humid air. PIERRE JOLIBOIS AND PIERRE LEFEBVRE. *Compt. rend.*, **176**, 1476–8(1923).—Plaster dried above 300° loses the property of setting in contact with H_2O, its absorptive power tested by I vapor diminishing with increase of drying temp. Dried at low temp. it darkens rapidly in I vapor; heated to 500° it becomes pale rose; at 800° drying it remains colorless after a month's exposure in a desiccator satd. with I vapor. Sensible heat evolution in transformation by drying was registered photographically with the double galvanometer of LeChatelier and Saladin. A current of air satd. with H_2O vapor at 0° and 15° was passed over a small boat contg. about 0.5 g. plaster and wt. increase detd. Plaster dried between 150° and 300° absorbs H_2O rapidly; when the content of demi-hydrate exceeds 2% the speed diminishes. With very moist air the absorption proceeds much more slowly and is quickly limited to an amt. corresponding to a content less than the demi-hydrate. H. E. B. (*C. A.*)

5. The chemism of the hardening of Roman dolomitic cements; crystalline forms of hydrate of magnesia; colloidal form of hydrated lime. M. VON GLASENAPP. *Zement*, **11**, 489–92, 509–10(1922); *Chimie et industrie*, **9**, 968(1923).—Pulverized MgO, obtained by burning magnesite at a moderate temp., sets when mixed with water, the setting being quicker the lower the burning temp. The hydrated product can still be scratched with a finger nail after 48 hrs., but it slowly hardens. Hardening of calcined magnesite, as observed under the microscope, is due to the transformation of coarse MgO crystals into fine crystals of hydrate; but as combination with water is much quicker than crystn. there must be formed as intermediate compd. an amorphous hydrate more sol. in H_2O. In com. mortars the transformation of MgO is confined to the formation of fine crystals of hydrate in and on the fine grains of cement and at the surface of the grains of sand to which the hydrate adheres. But in lab. prepns. hydrated MgO assumes a surprising variety of forms. G. has even observed one having the appearance of a gel consisting of fine droplets of the same size and shape as yeast cells. A. P.-C. (*C. A.*)

6. The setting and hardening of cements. S. N. BROWN. *Chem. Trade J.*, **72**, 127–8(1923).—The formation of a hard mass from powdered solids and H_2O may occur as follows: (1) Crystn. of the substance; (2) desiccation of colloidal, semi-solid mass or

"gel;" (3) a chem. reaction between 2 or more substances in H_2O giving either a cryst. or colloidal product or both. Burned gypsum or plaster of Paris is an example of (1), CaO mortar and clay of (2), and Sorrel cement of (3). K_2SO_4 accelerates setting of gypsum, while borax retards it. K_2SO_4 retards setting of Portland cement and CaO. The speed of setting of Portland and hydraulic cements is increased by presence of larger amt. of Al_2O_3. Because it withdraws Al_2O_3 from soln. gypsum retards setting of cement. Cements made from stationary kilns contain ash from fuel. Salts present in the ash retard setting. Rotary-kiln cements set more quickly because of absence of ash, and 1–2% of gypsum is usually added to retard setting. Nearly 50% by vol. of hardened Portland cement of normal fineness consists of unaltered particles and could easily be replaced by sand. This emphasizes the importance of having cements finely ground. Formation of $CaCO_3$ has very little effect on hardness of cement. H. C. P. (*C. A.*)

7. Hydraulic binding materials. I. Cement. E. Berl and W. Urban. *Z. angew. Chem.*, **36**, 273–6(1923).—The simple systems CaO–SiO_2, CaO–Al_2O_3 and SiO_2–Al_2O_3 were studied, not in a homogeneous, fused state, but in a heterogeneous condition at low temps. The components were prepd. in amorphous form with max. ratio of area to wt., and with max. reactivity; then intimate mixts. of these were allowed to harden and the crushing strength was detd. SiO_2 contg. 49% H_2O was prepd. from Na silicate and HCl; Al_2O_3 contg. 35% H_2O was prepd. by pptn.; CaO was used in the form of powd. hydrated lime. Cubes contg. SiO_2 and CaO in the mol. ratio 1 : 1, 1 : 2 and 1 : 3, and similar mixts. with the addition of sand to make mortars, showed crushing strength a max. for the mono-Ca silicate and a min. for the tri-Ca silicate, both on specimens that had been kept in a moist closet for 28 days and on those that had been kept for 3 days after treatment in an autoclave at 15 atms. for 8 hrs. Specimens with mol. ratios of CaO : Al_2O_3 1 : 1, 2 : 1, and 3 : 1, show max. crushing strength for the tri-Ca aluminate, and min. for the mono-Ca aluminate. For SiO_2–Al_2O_3 in mol. ratio 1 : 1 there was little apparent binding power, except when the specimens were allowed to lie in alk. water, and then it was but small. For the complex mixt. $CaO.SiO_2$ + 2.5 $CaO.Al_2O_3$ there were greater crushing strengths than for either pair taken separately, showing that the mixt. "reacts hydraulically" better than do the simple compds. Tables, curves and diagrams substantiate these conclusions. Zeolite (permutite) was then chosen as an amorphous SiO_2–Al_2O_3 complex and its behavior with CaO noted. The permutite, $Na_2O.Al_2O_3.3SiO_2$. (3.5 to 5) H_2O, was dried, powd., mixed with sand, and treated with increasing quantities of CaO. The superior limit of strength was reached with 3 to 4 mols. of CaO to 1 mol. of permutite. A reverse of this process, *i. e.*, replacing Ca by Na in the above products, did not take place. Evidently a secondary reaction had taken place, with the formation of Ca silicates and aluminates. Studies on the action of water (vapor) showed that $Ca(OH)_2$ and $Ca(OH)_2.H_2O$ were unquestionably formed from CaO, and that similar points of inflection of curves were found in unsound cement, and less marked resemblances in good cement. W. C. E. (*C. A.*)

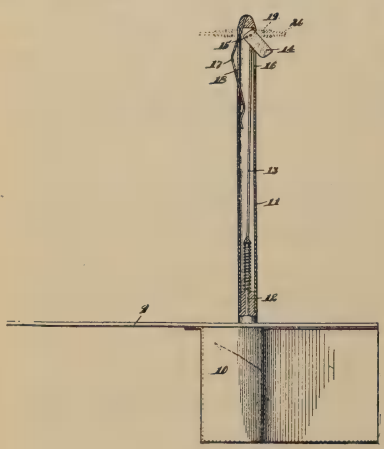
8. Behavior of hardened Portland cement under pure water. G. Haegermann. *Zement*, **11**, 377–9, 388–90, 399–401, 412–3(1922); *Chimie et industrie*, **9**, 311(1923).—If the water is not changed, it first dissolves CaO from the cement, and when it is satd. there is no further change. If the water is changed, or with running water, it continually dissolves out fresh quantities of CaO. An impermeable and insol. coating must be applied to protect the cement, *e. g.*, $CaCO_3$, which explains why cement hardened in air or under natural water (contg. bicarbonates and free CO_2) behaves better under water than one hardened under pure water. A. P.-C. (*C. A.*)

9. Protection of cements against the action of acids. C. R. Platzmann. *Zement*, **11**, 390–1(1922); *Chimie et industrie*, **9**, 312(1923).—P. investigated the use of "Margalite," a PhOH-CH_2O condensation product prepd. by Marcusson. One kg. covers

2 m.^{2} of concrete. Test pieces made from 1 part blast furnace slag, 0.25 part of trass, and 0.75 part of normal sand were treated with Margalite 3 weeks after prepn., and 10 days later were immersed in 10% H_2SO_4 and 25% HCl, resp. After 33 and 47 days' immersion the crushing strength was 306–319 kg. per cm.^{2} A. P.-C. (*C. A.*)

10. Crystalloids and colloids in the theory of cement. M. VON GLASENAPP. *Zement*, **11**, 446–8(1922); *Chimie et industrie*, **9**, 312–3(1923).—Crystals of *hydrated Ca silicate* can be observed under the microscope. They are always in the form of needles, grouped in rosettes against a background which seems to be formed of very fine grains constituting a gel the opacity of which under the microscope increases with age. Even after one year this gel still retains its colloidal texture, and it is doubtless this constituent which plays the principal rôle in the hardening of the cement. The crystals of the rosettes can be reproduced and observed by applying a drop of water to cement dust under the microscope. A. P.-C. (*C. A.*)

11. Effect of low temperatures on the hardening of cement. H. KREUGER. *Beton u. Eisen*, **21**, 74–8(1922); *J. Soc. Chem. Ind.*, **41**, 635A.—K.'s investigations cover the effect of low temps. on the compressive strength of 1 : 3 cement and sand mortar contg. from 8% to 15% H_2O. The normal tests were for mixts. with 8% H_2O, and hammered into mold, 7 days, 345, and 28 days, 560 kg. per sq. cm. Immediate exposure for 3 days at —15° to —18°, followed by 1 day moist air at +15° to +18° and the rest in H_2O at same temp., showed reductions in compressive strength in cubes with 8% H_2O of only 23% and 16% for 7- and 28-day tests. Similar frost exposure tests beginning at the start, the middle and the end of the setting period showed the following reduction in compressive strength, resp.: for the 28-day test only 14%, 4% and 0%. Plastic mixts. made by hand contg. 12.7% H_2O showed normal tests, 7 days, 154 and 28 days, 317 kg. per sq. cm. The losses by immediate frost exposure were 30% and 35% resp. The losses by frost exposure at beginning of set as above were, for the 28-day tests, 24.0%, 22.7%, and 17%, resp. Injury was avoided and normal strength developed if the mortars contg. 8% H_2O were kept for 2 days at +4° to +6° before the 3-day exposure to —18°, followed by 1 day in moist air and the rest in water at +15° to +18°. Alternations of —18° and +18° on successive days, following 1 day of moist air at +15° to +18°, reduced the strength after 28 days by only 14%. If, however, the freshly mixed mortar was immediately exposed to —18° for 1 day and then to 1 day in H_2O at +18° and 1 day in air at —18° to the end of test, the loss of strength in the 28-day test was 60%. Plastic mixts. (15% H_2O) were weaker at the start and lost heavily by the alternating treatment. At +3° the rate of hardening is only half of the normal rate at +15° to +18°. The practical point is that 2 days holding of the mortar at +4° to +6° protects it from damage by subsequent freezing. Reference is made to studies on cooling of fresh concrete in freezing weather by T. Yoshida, *C. A.*, **16**, 152. J. O. H. (*C. A.*)



12. A new "wet" process of lime manufacture. N. C. ROCKWOOD. *Rock Products*, **24** [19], 25–8(1921).—An illustrated description of the patented process of Schaffer and Crow (cf. *Ceram. Abs.*, **1** [3], 92 (1923) for utilizing H_2O vapor in calcination. C. C. D. (*C. A.*)

PATENT

13. Counting device. JACQUES ROUSSO. U. S. 1,463,910, Aug. 7. A counting device

comprising a guide; counting means on said guide operable by the passage of articles thereon; a register operable by said counting means; and means, operable by said register, for locking said counting means against operation after a pre-determined number of operations thereof in position to prevent the passage of further articles, substantially as described.

Glass

14. Optical glass. E. IRVINE. (*Nat. Phys. Lab.*) *Engineering*, **116**, 93(1923).—In the work on optical glass Miss I. has been able to make large pots by the pressure-casting process. For the viscosity researches, rods of glass had been drawn by means of an appliance due to R. L. Frink and the National Physical Laboratory. Previously the rods had been drawn through water-cooled steel vessels at such a rate that they became chilled in the desired shape; iron has been advantageously replaced by aluminum. Really satisfactory pot materials, which will resist the attack by the molten glass, have not yet been found; pure fused zirconia is still on trial. O. P. R. O.

15. Volume production of incandescent lamp bulbs. GEORG GEHLHOFF. *Zeits. d. V. deut. Ing.*, **67B** [21], 524–6(1923).—Description of bulb production as practiced in Ger. discussing types of bulbs, compn., melting and working practice. W. M. C.

16. The basis of progress in the glass industry. G. KEPPELER. *Zeits. d. V. deut. Ing.*, **67B** [27], 509–12(1923).—Discusses progress achieved in fuel tech., machine development in hollow ware, table ware, window, plate and other glass manuf. Chem. and phys. developments in the field of glass tech. W. M. C.

17. A modern window glass plant. R. KNORRN. *Zeits. d. V. deut. Ing.*, **67B** [27], 513–6(1923).—Gives plans and working drawings describing layout of the plant at St. Ingbert in Pfalz. W. M. C.

18. The technology of the glass furnace. H. MAURACH. *Zeits. d. V. deut. Ing.*, **67B** [21], 517–22(1923).—Treats of fur. design and opern., combustion conditions, temp. measurement, burner arrangements, fuel requirements and plant design. W. M. C.

19. The annealing of glass. F. ECHERT. *Zeits. d. V. deut. Ing.*, **67B** [21], 522–3 (1923).—The conditions underlying the presence and elimination of strain are described. W. M. C.

20. Grinding and polishing of plate glass. A. SCHILD. *Zeits. d. V. deut. Ing.*, **67B** [21], 538–42(1923).—Detailed paper with micro-photographs of ground and polished glass surfaces, diagrams, and sketches of equipment. W. M. C.

21. A comparison of French, English, German and Austrian laboratory glassware. P. NICOLARDOT. *Chimie et industrie*, **9**, 233–44, 469–84(1923).—N. reviews previous work, describes at considerable length his own expts., comparing them with previous results by others, and reviews and discusses the work of Cauwood, English and Turner (*C. A.*, **12**, 212). The most suitable test for rapid classification of glass, from the standpoint of resistance, is heating with water under pressure at 120°, 140°, 160° and even higher, for a sufficient time to obtain appreciable attack of the glass. 0.1 *N* HCl attacks glass less than pure H_2O does at 100°, but more after than before heating with H_2O under pressure. Attack by NH_4Cl is due to the NH_3, not the HCl. High-grade glass wares are resistant, even after prolonged use, English and French glasses being superior to German. Steam does not attack glass as much as water does (at the same temp.) and can be neglected when boiling analytical solns. at atm. pressure. N. gives analyses of the 14 glasses which he investigated, and discusses at great length the effects of the various constituents. This part cannot be satisfactorily abstracted. A. P.-C. (*C. A.*)

22. Catalysis in glass formation. E. GERLACH. *Chem.-Ztg.*, **47**, 146(1923).—F and missible amts. of Fe_2O_3 in limestone for sands of various iron contents. From

calcns. of representative batches, the max. permissible for a decolorized glass was found to be 0.18%, but this is regarded as a dangerously high figure in practice. Samples quoted ranged from a Dowlow (Buxton) limestone with Fe_2O_3 0.01% (non-volatile insol. matter 0.32%) to a soapworks waste with Fe_2O_3 0.10% (non-volatile matter 0.51%). For pale green glass suitable samples ranged from Barnetby limestone with Fe_2O_3 0.14% (non-volatile matter 1.94%) to a chem. works waste with Fe_2O_3 0.32% (non-volatile matter 3.62%) while for a dark green bottle glass the limes with high Fe_2O_3 content were desirable as, in conjunction with a low-grade sand, they supplied the bulk of the coloring oxide needed in the glass. J. S. C. I.

23. British glass industry; its development and outlook. W. E. S. TURNER. *J. Soc. Glass Tech.*, **6**, 108–46(1922).—Presidential address, contg. an account of the history of the industry with statistics as to number of factories, workmen, production, exports, imports, etc. (*C. A.*)

24. Problems in the melting of glass. II. Discussion. *J. Soc. Glass Tech.*, **6**, 147–56(1922).—(1) *Best ratio of cullet to batch.*—When batch alone is used, the glass takes longer to plain and is also somewhat softer. It may contain very fine seed which affects its working properties. The cullet contains more iron and more alumina than the batch, therefore it makes the glass more colored and more viscous, but it helps in plaining. Practice varies widely, depending largely on the amount of cullet available. In the case of tank furnaces, the important thing is to keep the ratio constant so that the properties of the glass will not change. (2) *Salt cake vs. soda ash in soda-lime glass batches.*—Although no scientific explanation is at present available, it is a matter of experience that glass made from batch containing salt cake is easier to work, and apparently has a longer viscosity range than if soda ash alone is used. It was suggested that this is due to greater homogeneity. It is American practice in making window glass to use 1 part salt-cake to 2 parts soda ash. However, the salt cake is more corrosive of the refractories and sometimes gives a bluish green color. See also *Ceram. Abs.*, **2** [5], 93(1923). (*C. A.*)

25. Columnar structure in sandstone tank blocks after rapid heating and cooling. JOHN CURRIE. *J. Soc. Glass Tech.*, **6**, 156–60(1922).—Blocks forming the lower course of the walls of a green bottle glass tank became rapidly heated from about 800° to 1300° during the draining of the tank and were then rapidly cooled. They were found to show a columnar structure normal to the cooling planes, similar to that of basaltic columns. Four photographs are reproduced. (*C. A.*)

26. Medieval glass of York Minster. W. F. NORRIS. *J. Soc. Glass Tech.*, **6**, 160–7(1922).—York Minster has over 25,000 sq. ft. of English glass of the 13th, 14th and 15th centuries. During the War, 23 windows were removed for preservation, and it was then found that the lead had disintegrated and the glass seemed to be diseased, many pieces being badly pitted and some having scaled off until they were paper thin; others had crumpled to dust. The windows were being gradually cleaned and releaded, the mellowing effect of centuries of dirt being removed but the original brilliancy being restored. W. E. S. Turner explained the disease as due to a *gradual hydration of the glass*, which was doubtless a lime glass made from French sand with perhaps not much alumina. (*C. A.*)

27. Heat-resisting glasses. W. E. S. TURNER. *J. Roy. Soc. Arts*, **71**, 401–12; *Glassworker*, **42** [30], 13, 21, 22, 24, 26(1923).—A discussion of the whole subject. The work done at Jena, establishing the relationships between the mechanical properties and chem. compn. in glasses, needs revision. Also in *Potter Gas.*, **48**, 607–17 (1923). G. E. B. (*C. A.*)

28. Manufacture of colorless glass in a tank furnace. F. W. ADAMS. *J. Soc. Glass Tech.*, **6**, 205–10(1922); *Pottery Gaz.*, **47**, 1031, 1033.—The tank should be long

enough and deep enough to melt and "fine" the charge properly before it is passed through the "doghole." The working end should hold slightly more than the estd. daily output. Good refractories are essential, as modern machines need a fairly soft and therefore corrosive batch. A batch with a high content of soda ash corroded blocks of high silica content more than blocks of high alumina content in the same furnace. A block which withstood the action very well was close grained and had the compn. SiO_2 58.9, Al_2O_3 37.58, Fe_2O_3 1.71, CaO 0.54, MgO 0.47, Na_2O 0.36, K_2O 0.84%. The necessity for regular chem. supervision of batch materials and for thorough mixing and accurate weighing is emphasized. MnO_2 is a cheaper decolorizer than Se, but is affected by furnace conditions, *e. g.*, by standing over the week-end. With Se quick melting is essential to prevent loss by volatilization. The coloring effect is regarded as due to colloidal particles of Se sepg. out. The melting temp. is detd. by the type of batch used and by the output, but is normally about 1350–1400°. More Se is needed at lower temps., with the danger of producing a dirty brown color, which with a rise in temp. of the tank turns to a decided pink. The Se glass in the leer if too cold becomes green, and if too hot pink. Storage of Se glass in strong sunlight has been known to produce a yellow color, which can only be removed by re-melting. A. recommends the stabilization of working conditions as far as possible once they have been worked out for a given amt. of iron in the batch. For discussion see *Pottery Gaz.*, **47**, 1208–10.

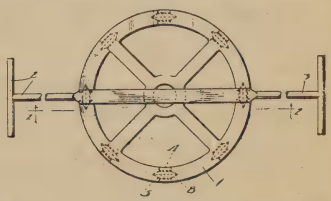
J. S. C. I.

29. Density of soda-lime-magnesia glasses and calculation of density. S. English and W. E. S. Turner. *J. Soc. Glass Tech.*, **6**, 228–31(1922).—The substitution of magnesia for lime in the trisilicate glasses brought about a continuous lowering of the d. without any sign of a minimum value, such as was observed in the case of the annealing temps. Baillie's proposal (*Ceram. Abs.*, **1** [5], 145; *ibid.*, **1** [1], 19) of the formula, $A/D = p_1/d_1 + p_2/d_2 + p_3/d_3 + \ldots$ instead of Schott's, $100/D = p_1/d_1 + p_2/d_2 + p_3/d_3 + \ldots$, A being the sum of the oxides, gave good results, but the authors' method (*C. A.*, **14**, 3509) had a more definite basis in that the d. of silica was assumed unchanged in the glass and from that the soda, lime, magnesia, etc., factors could be calcd. by using a plain soda silicate and then a soda-lime silicate, etc. Results obtained by Schott's, Baillie's, and the authors' methods were compared with observed values and it was shown that while Schott's method gave greatly divergent values, those obtained by Baillie's method were very near, and those by the authors' method still nearer, the observed values.

J. S. C. I.

30. Mixing of glass batches in factories. A. W. Dickenson, V. Dimbleby, L. E. Norton and W. E. S. Turner. *J. Soc. Glass Tech.*, **6**, 234–46(1922).—The grain size of all constituents should preferably be similar. Very fine sand and in some instances very fine lime should not be included, as they contain undesirable impurities. The danger of segregation of perfectly dry batch when stored in hoppers over the "doghouse" of a tank furnace is pointed out and also the beneficial effect of moisture, up to a point, in preventing this. Various analyses of batches mixed by hand and by 3 different types of mixing machines showed a decided superiority as regards homogeneity of the machine-mixed batch over that mixed by hand.

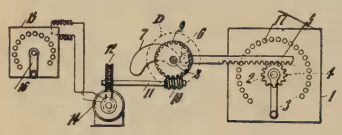
J. S. C. I.



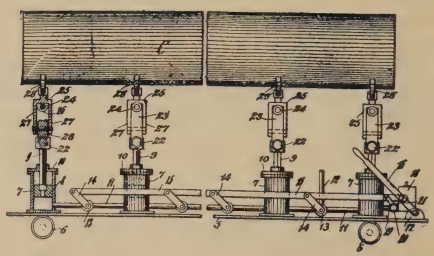
PATENTS

31. Tool for cutting glass while in a plastic state. Daniel S. Beebe. U. S. 1,457,491, June 5. A cutting tool for glass comprising a frame in the form of a ring having radial stiffening arms extending across the same, and a series of small cutting wheels mounted in a circle on the under side of the ring so as to rotate about axes forming radii of said circle.

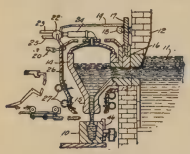
32. Method and apparatus for drawing glass cylinders. THOMAS STENHOUSE. U. S. 1,460,285, June 26. In mechanism to control the speed of acceleration of drawing glass cylinders, a movable part controlling the operation of the drawing apparatus, and mechanism to automatically actuate said movable part, including a rectilinearly movable element, a cam co-acting with said element; and means to operate said cam at a predetermined speed whereby the speed of the drawing operation is automatically increased in proportion to the decrease in temperature of the glass.



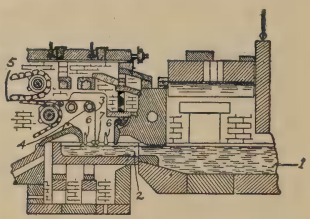
33. Method of and apparatus for supporting glass cylinders. THOMAS STENHOUSE. U. S. 1,460,286, June 26. In a support for glass cylinders, a plurality of spaced supporting units, each including a cylinder and a piston operating therein, a supporting saddle for the glass cylinder, mounted upon each of the pistons, and transversely movable relative to the axis of the cylinder, fluid supply means connecting and affording communication between the several cylinders, the fluid medium in the respective cylinders exerting a variable sustaining influence upon the pistons thereby to equally distribute the weight of the glass cylinder between the supports, and manually operable valves for closing communication between said cylinders to maintain the sustaining influence of the fluid medium constant and lock the supports against vertical movement during the severance of the glass cylinder into sections.



34. Apparatus for producing charges of molten glass. CLYDE R. LOTT. U. S. 1,458,834, June 12. The combination with a receptacle to contain molten glass and having a discharge opening in the bottom thereof through which the glass discharges downwardly, a mechanical cutter, means to periodically operate the cutter to sever charges of glass at a point a short distance below the discharge opening and then withdraw the cutter, a burner located at one side of the path of the glass, and means to shift the burner beneath the discharge opening after the cutter withdraws and direct a flame against the freshly cut surface of the glass. See *Ceram. Abs.*, **1** [1], 23(1922).

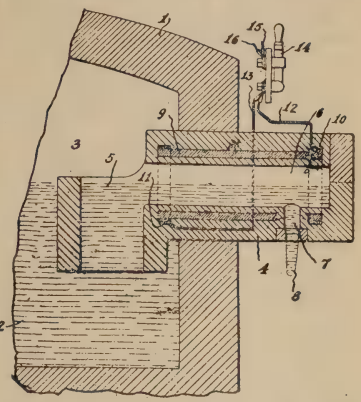


35. Method of and apparatus for drawing sheet glass. SETH B. HENSHAW. U. S. 1,460,582, June 3. In a sheet glass drawing apparatus, means for drawing a flat sheet from the glass mass and rolling dies engaging the edges of the sheet near its source driven to have a peripheral speed of not to exceed one-half the speed at which the sheet is drawn.



36. Feed trough for glass furnaces. WALTER G. CLARK. U. S. 1,458,522, June 12. In combination, a furnace; a feed trough therefore comprising a horizontal portion having a closed outer end wall and downwardly opening port near its outer end and having at the inner end an upflowing glass feed trough consisting of a riser chamber open at both ends and extending somewhat above the axis of the housing through which the glass rises upwardly from below its level within said chamber; an electric-resistance heating means associated with said trough and completely embedded in the walls thereof and extending substantially from end to end

of the horizontal portion, whereby to melt the glass within said trough; a second heating means comprising electrodes in communication with the interior of the trough at opposite ends thereof, whereby the glass may be maintained in molten state by passing a heating current through the molten glass; and a pair of controllable electric current supply means whereby current may be supplied at will to said resistance heating means or said second means or both.

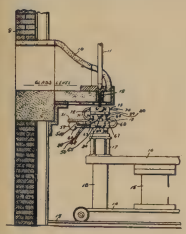


37. Glass-blowing machine. JAMES M. YOUNG. U. S. 1,458,454, June 12.

38. Take-out and delivery device for glass-blowing machines. JAMES M. YOUNG. U. S. 1,458,455, June 12.

39. Take-out and steadying device for glass-blowing machines. JAMES M. YOUNG. U. S. 1,458,456, June 12.

40. Method of and apparatus for feeding molten glass. SCOTT DAVIDSON. U. S. 1,458,167, June 12. The herein described method of delivering glass to the molds of a forming machine, which consists in the establishment of a regulated stream of glass, arresting the downward movement of said stream until a sufficient mass of glass has been accumulated therefrom, supporting said mass along its bottom and its side a predetermined interval, and then first releasing the mass entirely on its bottom and simultaneously during such release imparting to the batch a rotary movement, and immediately subsequent to the release of the batch on its bottom a jolt for assisting the discharge of the batch by gravity.



Heavy Clay Products

41. Study of the warpage of refractory mixtures, clays, kaolin, and porcelain when fired at different temperatures. M. MARC LARCHEVÊQUE. *Céramique*, **26**, 167–80 (1923).—The purpose of this work was to study the resistance of ceram. bodies to warpage at different temps. Bars 25.1 cm. x 2.2 cm. x 1.0 cm. were molded and after they had been dried were placed across two knife edges 20 cm. apart. The warpage of these fire-clay bars after being fired to different temps. was measured. Tests were made on raw bars and also with the same clay bars after they had been fired between 1375° to 1400°C. It was found that the warpage was much less on the bars that had been fired to 1375–1400°C than on the raw bars. The resistance of kaolins to warpage after firing was very high. The resistance of some porcelains to warpage was very good. Tests were also made with mixts. of washed fire clay and grog and different kinds of sand. Bodies made with 1 part of clay and 1 part of sand were more resistant to warpage than bodies containing 1 part of clay and 1 part of grog. Bodies contg. the finer grained sand were more resistant to warpage than those contg. coarse sand. Mixts. contg. a no. of clays instead of one often produced bodies having a higher resistance to warpage than bodies composed of one clay. H. G. S.

42. The use of the petrographic microscope in ceramics to examine the structure of clay in the raw and fired state. LÉON BERTRAND. *Céramique*, **26**, 180–94(1923).—The examn. of thin sections with the petrographic microscope affords a quick and easy method of examg. the structure of clays. Microphotos. are shown of plastic clays

free from quartz; clays with fine-grained quartz; clays contg. iron stains, clays contg. coarse grains of quartz and clays contg. crystalline kaolinite. The examn. of thin sections of quartzite also affords an excellent method for selecting the better grades of quartzite for silica brick. With quartzites from a certain district those having the finest grains were found to be best adapted for producing silica brick. By examg. these under the microscope it is possible to select the better grades of quartzite from the poorer grades. Great emphasis is placed upon the size of grain of the quartz both in clays and in quartzites. H. G. S.

43. Government specifications on all types of brick work. ANON. *Brick and Clay Record*, **62**, 869, 872–3, 892(1923). J. W. H.

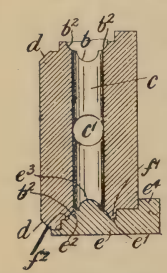
44. Darlington Clay Products Co. II. C. FORREST TEFFT. *Brick and Clay Record*, **62**, 858–62(1923).—For the first installments see *Ceram. Abs.*, **2** [7], 156–7 (1923). Final installment with description of control equip. used for gases passing through drier. Also method of setting kiln, starting fires, burning schedule and kiln cooling. J. W. H.

45. (Coal) Clinker brick. J. KOLZNER. *Rev. Mat. Constr. Trav. Pub.*, **164**, 112–4(1923).—Clinker of approx. compn. in %, SiO_2 40, CaO 12, Al_2O_3 16, Fe_2O_3 12, MgO and alkalies 7, undetd. 3, contg. 10–15% of unburned material has been successfully used for making brick. The dried material is ground in a battery of three mills, the last giving a powder. 8–10% by wt. of lime are then added by either (1) mixing with quicklime and slaking in a tank, (2) mixing with quicklime and slaking in a drum under steam pressure (German Method), or (3) mixing in the open air with lime previously slaked and bolted. K. states that the 3rd. method is less costly as to manuf., maintenance and initial cost, than the other two. The mixt. passes through a muller on its way to the presses. The brick are then piled on trucks and immediately put into an autoclave for 6–7 hrs. under satd. steam pressure of 7–8 kgms. L. N.

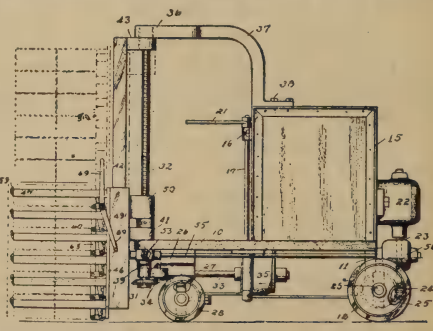
46. Romance in industry. STAFF ARTICLE. *Brick and Clay Record*, **62**, 940–73 (1923).—Technical description of reconstructed plants of Los Angeles Pressed Brick Co. located at Los Angeles, Santa Monica, and Alberhill, mfg. face brick, architectural terra cotta, roofing tile, hollow tile, refractories. The entire object of reconstruction based primarily on reduction of costs and not increased production. Photos of equipment accompany article. J. W. H.

PATENTS

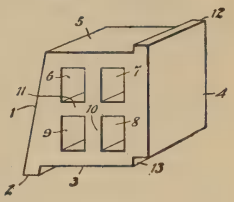
47. Building block. CAROLINE KELLY and THOMAS BELVOIR. U. S. 1,457,437, June 5. A block for building purposes comprising at least three elements stepped relatively to one another both vertically and horizontally, so that each block, although formed in one piece, is in the form of superposed parts and having vertical and horizontal grooves in its edges.



48. Truck for handling hollow blocks and tile. MERTON T. STRAIGHT. U. S. 1,457,639, June 5. A device for handling hollow tile comprising a frame, having a series of horizontal prongs spaced apart so that each may enter the opening of a correspondingly spaced tile of a series of adjacent and symmetrically arranged tile, means for elevating and lowering

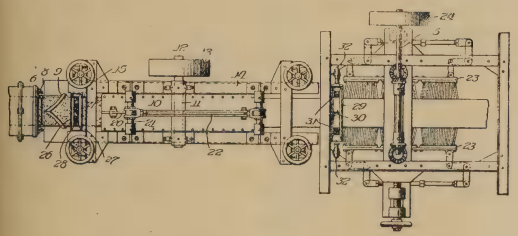


said frame, means for swinging said frame in a horizontal plane when in any of its vertical positions of movement, and means for moving said prongs longitudinally into and out of the tile when said prongs are in any of their positions of movement.

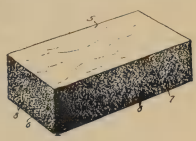


49. Clay shingle block and wall construction. ARTHUR HARDONCOURT, JR. U. S. 1,464,423, Aug. 7. A tile provided with opposite faces each terminating at one edge in a flange projecting beyond the body portion, one of said faces being relatively inclined.

50. Method of forming texture brick. FRANK W. BUTTERWORTH. U. S. 1,463,936, Aug. 7. The method of forming texture bricks comprising applying sand to the surface thereof and thereafter stippling said surface.



51. Sanded texture brick. FRANK W. BUTTERWORTH. U. S. 1,463,937, Aug. 7. A brick or the like having a substantially plane surface, said surface being broken by a series of spaced deformations, and a film of sand upon the undeformed surface of the brick.



Refractories

52. Fire brick disintegration. C. E. NESBIT AND M. L. BELL. *Brick and Clay Record*, **62**, 1042–3(1923).—Fire brick disintegration in linings of blast furnaces making iron seems greatest 40 to 50 ft. from top of fur. The authors, after comprehensive research, attribute disintegration of fire-clay brick in these positions to objectionable iron compounds in the fire clay. If fire-clay brick contains free or loosely combined Fe_2O_3, the CO in furnace atmosphere reacts with Fe_2O_3 depositing voluminous graphitic carbon which bursts the brick. Reaction is fairly rapid at 325 to 525°C. See *Chem. Met. Eng.*, **28**, 987(1923). Brick containing 1½% iron pyrites failed practically in same manner as brick with corresponding amt. of iron ore. The only practical remedy is to weather the clays in a layer not over two feet thick for at least two months. Sufficient space to insure the necessary supply for this period must be provided. If the weather is dry, the layer must be watered weekly. This treatment will oxidize the iron compds. which will be apparent by a change to a brown or yellow color. Such lumps or patches must be discarded and only the unstained clay used. Should the clay slake or break up readily, it should be turned over with a plow or some mech. means to expose the under side and the sorting repeated after weathering. J. W. H.

53. Making stiff mud fire brick. A. B. COCHRAN. *Brick and Clay Record*, **62**, 852–4(1923). J. W. H.

54. A new refractory tester. ANON. *Iron & Coal Trades Rev.*, **107**, 15(1923).—The appliance shown in Fig. 1 has been designed to embody all available experience for ascertaining the actual softening point of refractory materials under load; it also graphically records, by means of an automatic mechanism, the thermal expansion before the softening point is reached and the subsequent contraction, or compression. The app. consists of an elec. carbon resistance fur. 14, and of a lever press. The fur. is designed for a voltage of 100 to 120, and consumes about 12 kw. up to a temp. of 1600°C. The

fur., which is vertical, has an internal diam. of about 100 mm. An anvil of hard electrode carbon, about 300 mm. long, and 60 mm. diam., projects into the bottom of the fur.; the test piece is placed on the anvil and has a diameter of 50 mm. and a height of 50 mm.; it is cut out of a standard sized brick of the material to be tested, by means of a hollow diamond drill. Cubes can also be used, sawn out of finished bricks and having the two ends smooth. When new refractories are subject of research and test, the test pieces are conveniently prepared by pressing the substance into a steel mold and by subsequent firing. The upper carbon anvil or ram of 480 mm. length and also 60 mm. diam. is loaded. This is accomplished by means of the simple lever 1, which has its fulcrum at 2 and at the other end is forked and carries the two hinge pins 3. These pins press on the bearing of the plate 5, which hangs on 1 from which it can readily be detached. The plate 5 rests on the carbon ram 6. The load is varied by simply varying wt. in the scale-pan 12 which is hung from the lever 1 at point 4; the wts. can be varied between 20 and 40 kgs., which on an area of 20 sq. cm. corresponds to a load of 1 to 2 kg. per sq. cm. The plate 5 can be lifted from the ram 6 by means of the releasing gear which is worked by the lever 8. The movement of the lever 1, caused by the expansion and softening of the test piece is barely perceptible to the eye. To make the movement plainly visible it is magnified from 10 to 20 × by means of the rod 9 and the pointer 10 which is 1 m. long. By securing a stylus to the pointer 10, a curve is drawn on a recording drum 11

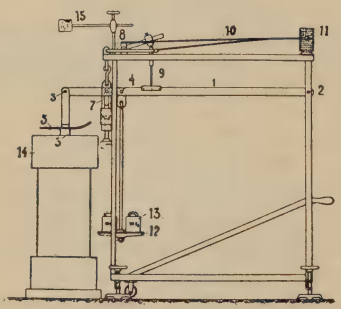


FIG. 1.—Details of refractory testing machine.

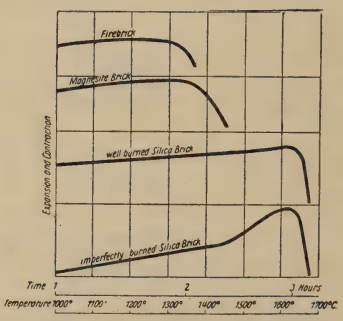

Firebrick
Magnesite Brick
well burned Silica Brick
imperfectly burned Silica Brick
Expansion and Contraction
Time 1 2 3 Hours
Temperature 1000° 1100° 1200° 1300° 1400° 1500° 1600° 1700°C

FIG. 2.—Curves showing expansion and contraction of refractories under test.

showing the expansion of the test piece and of the two carbon rods with uniformly increasing temperature. Fig. 2 shows a number of such curves relating to well-known refractories. The horizontal axis is marked with a scale of time corresponding to the speed of rotation of the drum. All curves were obtained with a uniform temp. rise of about 20°C per min. Thus a temp. scale is shown beneath the time scale and corresponding to the latter. The vertical axis measures the expansion and contraction of the test piece in furnace plus the expansion of the portion of the carbon ram which projects into the furnace. The rising portion of the curves corresponds to the period of rising temp. and expansion before softening. The moment the softening point is reached, the curve first becomes horizontal and then deflects rapidly downwards. Different types of refractory materials exhibit characteristic curves; under a load of 1 kg. sq. cm., fire bricks begin to soften between about 1200° and 1300°C. The compression which takes place with a further increase in temp. is slow; the curve for magnesite bricks is similar, with the exception that the softening point is higher, at about 1350–1400°C. The two lower curves represent respectively a high quality well-burned silica brick with a true sp. gr. 2.34 and an imperfectly burned silica brick with a true sp. gr. 2.51.

For the purpose of measuring the temp. of the test piece, the upper carbon ram 6, is provided with an axial hole 20 mm. diam. The center of the upper surface of the test piece can be observed through this hole and the temp. measured by an optical pyrometer protected from the radiant ht. of the fur. by diverting the rays at right-angles by means of the totally reflecting prism 15. Up to about 1400°C, the temp. can be measured accurately through the hole in the upper carbon ram; but above this temp. vapors are formed in the hole which disturb the path of the rays and cause the temp. to appear too low. In order to get over this difficulty a dense refractory tube (pyrometer tube), the lower end of which is sealed, is inserted into the hole in the carbon ram and the inner surface of the bottom of the pyrometer tube is observed. with the pyrometer. The temp. can also be measured by means of a thermocouple and read off on a galvanometer pointer or drawn by means of a recording apparatus. The whole app. is mounted in an angle iron framework. It is fitted with two rollers to enable it to be wheeled into position in front of the elec. fur. and the 4 rising screws in the feet enable it to rest firmly in position. O. P. R. O.

55. Studies on the dolomite system. I. The nature of dolomite. A. E. Mitchell. *J. Chem. Soc.*, **133**, 1055–69(1923).—Dissociation pressures of calcite, magnesite, and dolomite are different and definite; that of calcite being least, of magnesite greatest. It is concluded that the thermal dissociation of dolomite is represented by $CaCO_3, MgCO_3 \rightleftharpoons CaO, MgO + 2CO_2$. The thermal dissociation of calcite follows the Nernst equation. The sp. heats of magnesite and the solid decompn. product of dolomite are, respectively, 0.2033 and 0.2101 cal. at 15–20°. The heats of soln. of dolomite and its solid decompn. product in HCl have been detd., and the heats of formation of the 2 substances from their elements calcd. It is yet impossible to decide whether dolomite is a singular point in a series of solid solns. or a compd.
E. F. H. (*C. A.*)

56. A chemical study of dolomites. N. Knight. *Proc. Iowa Acad. Sci.*, **28**, 37–45(1921); cf. *C. A.*, **15**, 3601.—K. reports analyses of specimens of dolomites, so-called, from a number of different countries, and states that some are properly termed dolomites, while others are Mg-limestones, with only a small % of Mg. Some contain very little of either Ca or Mg, but are sandstone. W. G. G. (*C. A.*)

57. The formation of emery observed at an occurrence of corundum rock in Uruguay. K. Walther. *Z. deut. geol. Ges.*, **73**, 292–338(1922); *Mineralog. Abstracts*, **2**, 12.—A corundum rock occurring with cordierite-hornfels and phyllite at Cerro Redondo, near Minas, is petrographically and chemically described. It contains a mineral regarded as monoclinic and dimorphous with diaspore, named *kayserite*. Theories of the origin of emery are reviewed, and a pneumatolysis of sedimentary rocks by AlF_3 is suggested. E. F. H. (*C. A.*)

58. The prochlorites of the corundum-bearing rocks. J. Orcel. *Compt. rend.*, **176**, 1231–4(1923).—The corundum deposits on the eastern coast of the U. S. are always associated with phyllites in which chlorites of rather constant compn. are prominent. Among them corundophilite, $SiO_2/R_2O_3 = 1.5$, and amesite, $SiO_2/R_2O_3 = 1$, contain the highest % of Al. Analyses of specimens from N. C., Pa. and Ga. are quoted. Analysis by O. of a specimen from the Carter Mine, Madison Co., N. C. gave: SiO_2 27.35, TiO_2 trace, Al_2O_3 25.3, Fe_2O_3 0.53, FeO 5.19, MnO trace, MgO 29.91, H_2O —0.08, H_2O +12.09, sum 100.45%. From the optical properties and chem. compn. the prochlorites may be divided into 2 groups: (1) the ferruginous or *ripidolites* defined by the ratio MgO/FeO = 3 or less, and a feeble birefringence (0.001 to 0.005); (2) the magnesian for which the ratio MgO/FeO = about 10 and the birefringence about 0.01. The name *grochauite* is suggested for this group. L. W. R. (*C. A.*)

PATENTS

59. Refractory composition. JOHN L. OHMAN. U. S. 1,458,723, June 12. A refractory composition for heat resisting articles, comprising crystalline alumina and crystalline graphite.

60. Refractory composition. JOHN L. OHMAN. U. S. 1,458,724, June 12. A refractory composition for heat resisting articles, comprising silicon carbide and crystalline alumina, and crystalline graphite.

61. Refractory composition. JOHN L. OHMAN. U. S. 1,458,725, June 12. A refractory composition for heat resisting articles, comprising crystalline alumina and fused silicon oxide, and crystalline graphite.

62. Non-recrystallized refractory material. WILLIAM A. FARISH. U. S. 1,458,913, June 12. A non-crystallized refractory material for heat resisting articles comprising silicon carbide, crystalline graphite, a carbonizing binder, and sand.

63. Magnesia refractory. WALLACE W. GREENWOOD. U. S. 1,461,444, June 12. A composition of matter comprising preshrunk magnesia grains forming the major portion of the total mass and a ceramic bond proportioned and constituted to unite the grains into a super-refractory body which will withstand drying and firing without detrimental shrinkage.

Whiteware

64. Microscopical examination of China clay. J. M. COON. *Pottery Gazette & Glass Trade Rev.*, **48,** 1162(1923).—Used with a grading elutriator it is valuable. General examn. can be made in water, but castor oil is a preferable medium; Canada balsam can be used but does not yield such high relief, as the difference in refractive index is less. It will be necessary to have at hand a quartz wedge and selenite plate, giving red of the first order. Reliable information is contained in A. B. Dick's paper in the "Mineralogical Magazine," 1888 and 1908, the latter giving the corrected optical details, which are readily verified with a decent microscope and proper material.

O. P. R. O.

65. China clay in California. THOS. NORMILE. *Brick and Clay Rec.*, **62,** 979–80 (1923).—Article contains interesting facts regarding early history of whiteware industry.

J. W. H.

66. Acid- and chemical-proof stoneware. M. A. KNIGHT. *Ind. Eng. Chem.*, **15,** 472–3(1923).—A general description of its manufacture and uses. C. H. K. (*C. A.*)

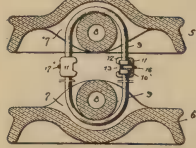
67. The development of high-tension porcelain insulators and the testing of same. J. F. SCHEID. *Elektrotechn. Maschinenbau.*, **41,** 253–61(1923).—A review.

C. G. F. (*C. A.*)

PATENTS

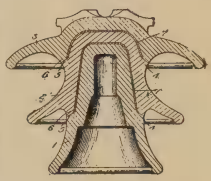
68. Porcelain. CHESTER C. TREISCHEL. U. S. 1,462,396, July 17. A raw batch for a porcelain mix comprising beryl as a component. See *Ceram. Abs.*, **2** [3], 55(1923).

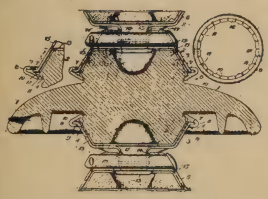
69. Insulator connector. GRANDON E. ECKERT. U. S. 1,458,811, June 12. A cotter pin for use with an apertured supporting member, said pin being formed from a strip of spring sheet metal of materially greater width than thickness, and comprising a pair of legs integral with and connected by spring bends to the head end of the pin, said legs being spaced apart and oppositely offset to form retaining abutments adapted to automatically engage the walls of the apertured supporting member and to prevent accidental disengagement of the pin after its insertion.



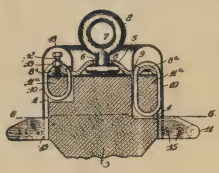
70. Insulator. WALTER T. GODDARD. U. S. 1,458,754, June 12. A pin type

insulator comprising a plurality of nested insulating sections each of which is provided with a hollow central portion having a threadless conical exterior surface, and each of which is also provided with an annular bearing shoulder inclining upwardly toward the center of the insulator, the said inclined shoulder on at least one of said sections projecting outwardly beyond the base of the said conical central portion of the section upon which it is formed and being adapted to coöperate with the said inclined bearing shoulder on the adjacent insulating section, the adjacent conical surfaces of said sections being spaced apart at all points above the surface of contact of said shoulders. See *Ceram. Abs.*, **2** [9], 200(1923).





71. Insulator. Walter T. Goddard. U. S. 1,458,755, June 12. The combination with an insulator provided with a central attaching head or lug having an annular undercut shoulder, of a two-part strain member loosely connected to the attaching head, said strain member comprising a cup-shaped body portion having an outwardly directed peripheral flange and an attaching ring, said ring being adapted to embrace the flange of the cup-shaped body portion and being provided with a plurality of independently yielding fingers having supporting engagement with the annular shoulder of the said head.

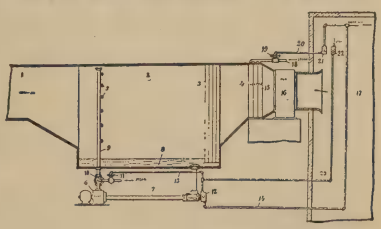


72. Strain insulator. Walter T. Goddard. U. S. 1,458,756, June 12. In a strain insulator, the combination with a frangible element of insulating material having apertures therein and a connected element, one of which is supported by the other through the medium of a continuous flexible member laced through the apertures in the frangible element, of a jack screw threaded into the connected element and bearing against the frangible element to exert a separating strain operating to stretch the flexible member and distribute its application of force among its bearing points.

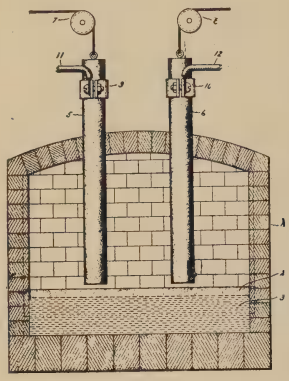
Equipment and Apparatus

PATENTS

73. Humidifying apparatus control. Adolph W. Lissauer and Walter L. Fleisher. U. S. 1,458,490, June 12. In combination with an enclosure, a humidifying apparatus control comprising a chamber through which air may be circulated before it enters the enclosure, a humidity control associated with the chamber, a heater for preheating the air coming from the chamber to the enclosure, a thermostat in the enclosure for controlling the heater, a second thermostat in the enclosure connected to the humidity control to prevent the operation of the said humidity control until a predetermined temperature is built up in the enclosure by the heater, substantially as and for the purposes set forth.

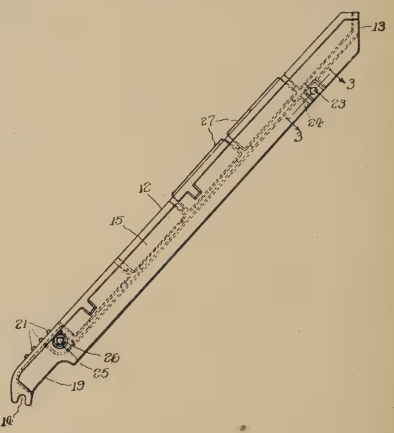


74. Electric furnace. Irving R. Valentine. U. S. 1,457,718, June 5. An electric furnace comprising a receptacle adapted to contain molten charge, a refractory, heat conducting solid body therein located above a charge in said receptacle and in



close thermal relation thereto and means for heating said body by one or more electric arcs.

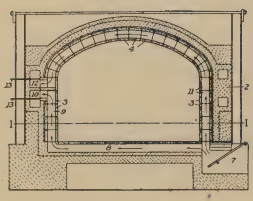
75. Furnace sectional dead grate with brick inserts. FRANK B. BIGELOW. U. S. 1,455,858, May 22. A furnace dead-grate section having a plate with an inwardly extended ledge on its inner face for the greater portion of its length between its upper and lower edges, a plurality of spaced braces joining the top face of said ledge with the inner face of said plate, a brace beneath one of said upper braces connecting the lower face of said ledge with the inner face of said plate beneath said ledge, said plate having an inwardly-offset apertured part adjacent to said lower brace and below said ledge, said plate also having an inwardly-extended plate-section along its top edge below the lowermost brace above the ledge, said plate beneath said top plate-section and adjacent to said lowermost brace having an inwardly-offset apertured part.



Kilns, Furnaces, Fuels and Combustion

76. Making brick and tile in Dixie. STAFF ARTICLE. *Clayworker*, **79**, 549–50 (1923).—The fol. data are given relative to the economy of the Minter system of drying and burning brick and building tile at Dixie Brick Co. of Columbus, Ga. Waste heat from kilns is used in driers, there being a nine track drier 110 ft. in length, accommodating 15 cars, each holding 570 brick. Two fans are used for the necessary draft. These fans are of special design and adapted to the work required. The brick are burned in nine Minter round draft kilns, twenty-seven feet in diameter, each holding 750,000 brick. The hot air from cooling kilns is conveyed in underground tunnels to the drier or to the kilns, as the occasion requires, and the system works so effectively that, though hard to burn, the brick are burned all hard in 72 hrs. Each kiln is burned twice a month, or 18 kilns are burned in 28 d. By this method the kilns are continuous in operation, and there is a decided saving in fuel and also in the time required to burn. J. W. H.

77. Clean producer gas. R. M. CHATTERTON. *Fuels & Furnaces*, **1**, 110–3 (1923).—The advantages of clean producer gas are compared to those of raw producer gas, city gas, natural gas, water gas, fuel oil and electricity. D. F. B. (*C. A.*)



PATENT

78. Muffle furnace. CHARLES F. GEIGER. U. S. 1,464,248, Aug. 7. In a muffle furnace, a muffle having in its roof hollow tiles forming a self-supporting arch and arranged to form a flue for products of combustion, said tiles being of uniform thickness throughout their length and joined together end-to-end without overlapping portions.

Geology

79. Saskatchewan clays and new industries. A. W. G. Wilson. *Nat. Resources of Can.*, **2,** July (1923).—Saskatchewan possesses extensive deposits of important raw materials in her clays; suitable for the manufacture of good building brick, structural and agricultural tile and sewer pipe; her ball clays and stoneware clays for the manufacture of pottery; and her refractory clays for fire brick. The University of Saskatchewan, under the auspices of the Provincial Government, has established a ceramic dept., with W. G. Worcester in charge. W. has supplied bricks for endurance tests in a locomotive on the Can. Pac. R. R., to be examd. at the end of each run. If these bricks stand the test, they will displace millions of dollars worth of imported bricks; but definite prophecies are reserved until final results are known. O. P. R. O.

80. Manganese deposits, South Africa. Anon. *Times Ltd. & Eng. Supp.*, **12,** 426(1923).—Rich deposits of manganese have been found in the district of Johannesburg, these newly-discovered deposits assay approximately 90% manganese. Exploitation on a commercial scale has not been accomplished, but the deposits apparently lie over a fairly extensive area. O. P. R. O.

81. Clays. R. H. Cambage. *Chem. Eng. & Mining Rev.*, **15,** 317(1923).—Clays of great variety are available in large quantity in New South Wales. O. P. R. O.

82. Chemical and physical characters of bentonite. E. A. Thompson and A. Sadler. Can. Rept. Mines, *Summary Rept. 1921*, No. **586,** 73–7(1923).—This clay when freshly exposed varies from light yellow to light olive green, with waxy luster. It is very fine-grained and has a soapy feel when wet. It swells and forms a jelly-like mass in an excess of water. Six samples from Canada and 2 from Wyoming were analyzed and 8 analyses of U. S. samples are quoted (cf. *C. A.*, **16,** 887). The Canadian samples were generally higher in SiO, and lower in Al_2O_3 than U. S. samples. Sp. gr., m. p., power of absorbing water and percentage of water remaining in the clay at temps. ranging from 450° to 700° were detd. There is no fixed relation between swelling properties and the quantity of combined water present. **Report of the ceramic division.** Joseph Keele. *Ibid.*, 253–70; cf. *Ceram. Abs.*, **2** [6], 138(1923).—The work of this division consisted mainly of a study of the raw materials used in the ceramic industries. These include clays, shales, feldspar, quartz, limestone, talc, bauxite, magnesite, etc. The kiln scum which obscures the color of facing brick was studied and methods for its prevention were described. L. W. R. (*C. A.*)

General

83. Quarry blasting. E. J. Strock. *Explosives Eng.*, **1,** 144(1923).—How we drill, blast, and keep records, the Supt. of a large shale and limestone quarry (Colorado Portland Cement Co.) describes in detail a successful system of blasting, giving numerous cuts. O. P. R. O.

84. Our ceramic family. Hewitt Wilson. *Clayworker*, **79,** 552–3(1923).—An interesting dissertation of the characteristics of the components of clay, that is SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO, Na_2O and K_2O. J. W. H.

85. The essentials of meeting competition. Ross C. Purdy. *Clayworker*, **79,** 558–60(1923).—An address before the Neb. Brick and Tile Assocn., Lincoln, Neb. March 7, 1923. J. W. H.

86. (French) Ceramic Congress of 1923. Anon. *Rev. Mat. Constr. Trav. Pub.*, **164,** 99B–100B(1923).—"Le Syndicat des fabricants de produits céramiques de France," with a membership of 512, held its convention at Paris from May 14–18. The first day's session was devoted to the study of forced (mechanical) draft as compared with natural draft in ceramic kilns. Among the other papers read were those on the im-

provements introduced in plate-making by Granger; the sagging of clays, kaolins, ceramic bodies and refractory mixts. at temps. of 1400°C by Larchevêque; the use of petrographic methods in ceramics in the study of the structure of clays and their transformations on heating, by Bertrand; and the colloidal plasticity of clays by Mr. Bigot. On May 16 Yeatman, president of the organization spoke on the work and purpose of the Society, emphasizing the three main events of the year, (1) the creation of a laboratory for the Society, (2) creation of a technical service bureau conducted by an engineer who studies and puts into practice the best methods of firing, and (3) participation in future fairs and expositions, notably that of "l'Exposition des Arts décoratifs de 1925." A business meeting followed. Later a banquet was held, at which Mr. Yeatman mentioned among other topics the apprenticeship for ceramic students now in vogue at "La Manufacture Nationale de Sèvres." May 17 and 18 were spent in visiting ceramic plants. L. N.

87. Silica. L. Heber Cole. (1923.)—Silica in Canada: Its Occurrence; Exploitation; and Uses, issued by the Mines Branch, Dept. of Mines, Canada. O. P. R. O.

88. Diatomaceous earth. L. Heber Cole. (1923.)—Silica in Canada, Its Occurrence, Exploitation and Uses, issued by Canada, Dept. of Mines, Mines Branch. Deposits of diatomaceous earth occur in the beds of numerous lakes and streams in both Nova Scotia and New Brunswick. This material is rarely found compacted and can readily be excavated by manual labor. It occurs in different degrees of purity, and is generally white or cream colored, and sometimes mixed with carbonaceous and arenaceous material in its more impure state. When impure its color may be yellowish or brownish. Nature and mode of occurrence of diatomaceous earths; description of deposits and analysis of these earths are all included in Mr. Cole's report; also uses. O. P. R. O.

89. Hardness and hardening. Walter Rosenhain. *Chem. Met. Eng.*, **28,** 899–901(1923).—A synopsis of a lecture given at various localities during a recent American tour. Parallel phenomena are found in many alloy systems which help to explain why steel is hard. V. O. H. (*C. A.*)

PATENT

90. Acceleration of vulcanization and products obtained thereby. Sidney M. Cadwell. U. S. 1,463,794, Aug. 7. A process for treating rubber or similar material which comprises combining with rubber a vulcanizing agent, a metal M, carbon disulphide and an amine having a replaceable ammoniacal hydrogen, the carbon disulphide and amine being combined with the rubber as separate materials, with respect to one another, and vulcanizing the rubber.

BOOK REVIEWS

The Wares of the Ming Dynasty. By R. L. Hobson. Published by Charles Scribner's Sons, New York City, 1923. Price $25.00.

This is a sequel to "The Early Ceramic Wares of China," by A. L. Hetherington, a work previously reviewed in the pages of *Ceramic Abstracts*[1] (Book Reviews). In his preface the author states, "The purpose of this book is to explain and illustrate as many varieties of Ming as possible. The text is based primarily on information obtained from Chinese sources and the occasional notes made by Europeans who visited China in the Ming period. To this must be added the deductions which can be made from the study of well-authenticated specimens, and, of course, the valuable work enshrined in the books which are mentioned in the bibliography.....The bulk of the

[1] See *Ceramic Abstracts*, **2** [4], 86(1923).

illustrations is drawn from private collections, but reference is made throughout to important examples which can be seen in public museums."

This is an authoritative and scholarly work on what is from a decorative point of view without question the most prolific period in the history of ceramic development.

To one not familiar with the various historical periods and their consequent influence on the work of later ceramists, it is impossible to realize the tremendous influence of the Ming potters. An estimate that does not consciously or unconsciously include the recognition of the inspiration or influence back of any achievement is at best superficial in character.

The Ming potters were by no means pioneers. For centuries previous to the Ming Dynasty, the Chinese had produced glazed colors and textures which would be the despair of studio and commercial art potters if such wares had to be reproduced today.

Fig. 1.—Flower pot with incised designs and colored glazes. Chêng Tê period. H. $6^1/_4$ ins. —J. Love Collection.

Fig. 3.—Jar of buff stoneware with pale olive-brown glaze: two dragons in relief disputing a pearl: inbricated pattern incised on ground. About 1600. H. 9 ins.—Franks Collection. (British Museum.)

Fig. 4.—Jar of reddish pottery with green glaze: peony scroll in applied relief, colored yellow and brown. Found in the ruins of Ayuthia. Late Ming. H. $8^3/_4$ ins.—British Museum.

Fig. 2.—Vase (mei pi' ng) with designs in cloisonné style and colored glazes. Waves, lotus plants and reeds: band of jewelled pendants. About 1500. H. $14^1/_2$ ins.—Honble. Evan Charteris Collection.

FIG. 5.—Wide-mouthed jar with gray-green celadon glaze. Eleven panels with animal and plant design in molded relief. Fifteenth century. H. 9¼ ins.—G. Benson Collection.

FIG. 6.—Potiche decorated in cloisonné style, with colored glazes. Green ground. Garden landscape with peacock and peonies. H. 1[illegible] ins.—G. Eumorfopoulos Collection.

FIG. 7.—Potiche with decoration in cloisonné style, with colored glazes. Dark blue ground. Taoist subjects—the three Star Gods playing checkers, the Eight Immortals, the twin Genii of Mirth and Harmony and Hsi Wang Mu with attendants. H. 15 ins.—Anthony de Rothschild Collection.

FIG. 8.—Flower pot. Hard buff pottery with colored glazes: deep aubergine brown ground and lotus designs in green, yellow and peacock blue: blue inside. Late Ming. D. 7½ ins. —Franks Collection. (British Museum.)

This does not mean that the present-day ceramist lacks the ability to reproduce these types, but it does mean that he concentrates on the chemical formula and the glaze content without working to a definite texture and color quality. In fact, the technical specialist is rarely able to express himself in terms of texture and color. In this country our own Prof. Binns is possibly a single exception. The museum group are experts in judging textures, and it is to this group, art critics and such works as the one under discussion that the technician must turn for guidance and inspiration.

To return to our subject, the author discusses conditions previous to the Ming period and outlines in fascinating detail the technical methods employed by potters in various periods of the dynasty.

The book is splendidly illustrated, and altogether it is a work that will be a source of inspiration to the technical man and a most valuable addition to the factory library.

The manufacturer who will buy such books as this instead of spending larger sums in purchasing competitors' samples will quickly bring about a great appreciation of quality among his productive and creative force. This greater knowledge would certainly be reflected in future work and would react in favor of a larger business in art wares.

We reproduce some illustrations selected at random from the book.

Another book, "Animals in Chinese Art," is announced. We hope to give some particulars at a later date. This should be a valuable work for the faience and terra cotta men.

F. H. R.

FIG. 9.—Bottle-shaped vase: of light buff stoneware with prunus design in low relief: bamboo-shaped neck. Colored glazes—aubergine on the neck, turquoise on the body and white and aubergine in the reliefs. Sixteenth Century. H. 10½ ins.—G. Eumorfopoulos Collection.

FIG. 10.—Bottle-shaped vase: buff stoneware with colored glazes—green ground and raised lotus designs in turquoise, aubergine, amber-yellow and white. Late Ming. H. 14¼ ins.—H. J. Oppenheim Collection.

Die Keramik im Dienste von Industrie und Volkswirtschaft. (Ceramics in the Service of Industry and National Economy.) By DR. FELIX SINGER, assisted by 90 collaborators. Friedr. Vieweg und Sohn, Brunswick, Germany, 1923. 1044 pp., 901 illustrations.

This large volume is the direct result of a suggestion from the industry and is intended to mark the 50th anniversary of the German Clay and Stoneware Works Company of Charlottenburg, certainly a unique and commendable enterprise for such a purpose. The list of collaborators includes some of the best known names of German specialists. The contents of the book deal with the general principles of ceramics, 238 pages, ceramic manufacture, 146 pages, the properties of ceramic products, 62 pages, and the uses of ceramic products, 539 pages. The larger part of the book is hence given to the subject of the products.

The part relating to the principles of ceramics is necessarily restricted to the most outstanding facts but these are presented very well, considering that the sections are

contributed by different authors and a certain lack of unity is unavoidable. Perhaps the treatment of this section has been too sketchy, as for instance in the discussion of drying. The discussion of glazes is still based on Seger's work and might have been revised.

The ceramic manufacturing processes are described very well if the great scope is considered which includes quartz glass, silica brick, magnesite refractories, stoneware, earthenware, porcelain, etc. Steatite products are for some reason emphasized out of proportion.

We find the third section of the book which deals with the properties of the ceramic products to be of special interest since it gives an excellent summary not only of the methods of determining the physical properties of porosity, density, mechanical strength, thermal and electrical properties but also a compilation of physical constants for different types of bodies.

The chapters dealing with the uses of ceramic products emphasize refractories, chemical stoneware and electrical porcelain. A large number of specific uses are illustrated and offer much of interest to the metallurgist and chemist, the sanitary engineer and furnace specialist. The presentation of the subject of chemical stoneware is the best the reviewer has seen. The text is not only descriptive but is interspersed with the results of tests relating to the properties of materials and the efficiency of apparatus. Special uses, such as rolls made from ceramic material for grinding and the shaping of plastic substances, ceramic catalyzers, illuminating accessories, electro-chemical containers and diaphragms, and even ceramic money are discussed.

The book concludes with a very complete treatment of electrical porcelain from all angles. This is about the only chapter in which references to the literature are made with any degree of consistency, for the lack of which the book might be criticized, but that is apparently owing to the dearth of foreign literature available in Germany due to the war. The principles of insulation, the type of insulators, their testing and their failures, and finally the specifications for electrical porcelain are discussed quite fully. This chapter should be of considerable value to the maker and the user of electrical porcelain.

Throughout the book there is evident a consistent endeavor to introduce exact physical constants and definitions in place of the descriptive and inexact terminology now common in the ceramic literature. The printing and the illustrating are well done. It is safe to say that this book is by far the best published on the subject.

A. V. Bleininger

CERAMIC ABSTRACTS

Compiled by the

AMERICAN CERAMIC SOCIETY

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Art

1. Further experiments on the measurement of color. T. M. Lowry and L. P. McHatton. *J. Oil Colour Chem. Assoc.*, **5**, 351–3(1922).—The densities of a number of Lovibond glasses were previously measured (*Ceram. Abs.*, **1** [10], 256(1922); *ibid.*, **2** [3] 47(1923)), and curves plotted to show the relationship between density and serial numbers of a complete series of glasses. These curves were almost linear, but when extended they cut the axis of 0 density at a point on the scale of numbers corresponding to —2 instead of 0. This has been found to be due to the fact that filters of equal density at the wave-length of max. absorption of light are not equal when examd. with white light. F. A. W. (*C. A.*)

2. Record of color research during 1922. A. E. Bawtree. *J. Oil Colour Chem. Assoc.*, **5**, 353–6(1922).—A brief description of improvements made to the color circle used in the Bawtree colorimeter (cf. preceding abstract.) F. A. W. (*C. A.*)

3. Color designation. Heinrich Trillich. *Farben-Ztg.*, **28**, 1001–2(1923).—See also *Ceram. Abs.*, **2** [4], 70(1923). F. A. W. (*C. A.*)

Cement, Lime and Plaster

4. Plaster of Paris technology. C. Elliott. *Chem. Trade and Chem. Eng.*, **72**, 725(1923).—(1) *The effect of ht. on gypsum.* The greater part of the plaster made today is obtained by grinding the rock to a fine powder and calcining it in suitable vessels by indirect heating. In Eng. finely-ground gypsum is spread to a depth of about 6 in. in large open pans (15 to 22 ft. in diam.) provided with stirrers to agitate the mass. About 3 or 4 T. of gypsum are calcined at a time, the complete opern. from filling to emptying taking 3 to 4 hrs. In the U. S. and Canada finely ground gypsum is calcined in large cylindrical vessels with cast-iron dished bottoms, the whole being set in brickwork and heated by a fur. placed underneath. (2) *The first and second boiling periods.* As the ground material is heated the temp. rises until at a certain point the evoln. of steam begins and this steam in rising through the material gives it every appearance of boiling. The "boiling" period represents the loss of about $^3/_4$ of the combined water, and while this is being driven off the temp. remains constant, all the ht. being utilized in vaporizing the liberated water. At the end of this "first boil" the material is mainly $CaSO_4.^1/_2H_2O$, or plaster of Paris. The temps. necessary to convert gypsum into $CaSO_4.^1/_2H_2O$ and also $CaSO_4.^1/_2H_2O$ into $CaSO_4$ depend entirely on the circumstances. The lowest temps. obtained exptly. in the lab. are 98°C and 107°C respectively, but as the time necessary is very great, temps. considerably above these are employed on the large scale in order to increase the speed of reaction. Commercially the "first boil" varies between 108°C and 130°C, while the "second boil" varies between 160°C

and 200°C. (3) *Direct heating methods.* The outside layers are protected by these parts and the ht. only slowly penetrates; the temp. at which any particular layer parts with $^3/_4$ of its water to form $CaSO_4.^1/_2H_2O$ is found approx. 100°C. This very steep temp. gradient from surface to center makes it possible to have anhydrous calcium sulphate at a dull red heat on the surface while a few mm. from the surface either $CaSO_4.^1/_2H_2O$ or even unchanged gypsum may exist. In both stationary kilns and rotary calciners the material after direct heating for a period is allowed to cool slowly, the heat absorbed by the lump slowly calcining the inner portions. Thus in kilns the heating may be 8 to 10 hrs. and the cooling 12 to 15 hrs., while in rotary kilns with smaller lumps, contact with the gases may only be for 10 to 20 mins. with cooling and "cooking" in large bins for a much longer period. (4) *Flooring and hard-finish plasters.* The most reliable information on this particular plaster is given by M. GLASENAPP. Flooring plaster consists of a mixt. of a hard, sintered, cryst. modification of the anhydrite with small quantities of a segregated, vitreous, basic anhydrite holding lime in solid soln. Normal flooring plaster is best made at about 900°C and as the temp. is raised above this up to 1300° (and over) the material becomes coarser in structure and harder with increasing amts. of the basic constituent. (4) *The noncondy. of gypsum.* This table shows condy., B.t.u., transmitted per hr. per sq. ft. of surface per degree F diff. of temp.:

No. inches		B.t.u.	No. inches		B.t.u.
3	Solid gypsum slab.....	0.25	3	Concrete slab, 1–3–5 mixt.....	0.75
4	Solid gypsum slab.....	.20			
5	Solid gypsum slab.....	.19	2½	Concrete slab.....	.85
6	Solid gypsum slab.....	.18	2	Yellow pine planks.....	.38

In above table, each type of material was covered with felt roofing material, but other expts. show that the corresponding fig. for 3 in. solid gypsum is 0.4 B.t.u., for 3 in. cinder concrete 1.2, and for stone concrete 2 B.t.u., when these were tested without covering. (5) *Fire-resistance of gypsum.* Expts. made on large gypsum blocks (Underwriters' Labs. in the U. S.); block used 6 in. thick, subjected to varying temps. for various temps. for various times:

4 HRS. AT 2200°F		2 HRS. AT 1900°F	
Distance from surface, inches	Temp., °F	Distance from surface, inches	Temp., °F
1	1980	1	950
2	1255	2	220
3	315	3	210
4	223	4	180
5	211	5	140
6	208	6	130

It will be noted that in the first case, although on one side the temp. of 2200°F had been maintained for 4 hrs., yet at the end of that period the temp. of the other side was only 208°F; that is, only 9½% of the heat on the fur. side had penetrated the block, while in the second case the amt. was only 6.8%. It is assumed that 10 foot lengths of gypsum, clay tile, and concrete are heated from 70°F to 1700°F by fire, then the resulting increase in length by fire would be approx.:

Gypsum.....	0.158 in.
Clay tile.....	.590 in.
Concrete.....	1.180 in.

Obviously this slight expansion in the case of gypsum is not sufficient to cause injury to either the material itself or the structure. O. P. R. O.

5. On the crushing strength of concrete and proportion of its materials. Shukichi Nagaya. *J. Jap. Cer. Assoc.*, **366,** 75–9(1923).—The paper may be regarded as summary of author's repts. which have been published since 1918. 1. *Amt. of water.* (*a*) Amt. of water used in concrete must be expressed in per cent of total amt. of cement and sand. (*b*) Excess of water reduces the crushing strength; the decrease per vol. per cent of water is about 100 lbs. per sq. in. for Port. cement-sand-gravel concretes. (*c*) The excess of water is the most usual cause of air cracking. The author has observed cracking due to blowing of cement in concrete construction only once in his career. (*d*) The effect of excessive water is more serious in concretes with volcanic ashes or diatomaceous earth, as they absorb much water. 2. *Propn. of sand.* The crushing strength of concrete depends chiefly on the nature of its mortar; the effect of varying propn. of gravel is very slight within wide range. Concrete with 1:3 mortar can never be as strong as that with 1:2 mortar. 3. *Aging.* Concrete with a cement which has been stored for 6 months is at least 10–20% weaker than that with fresh one. (Failures in concrete structures frequently owe to an old cement which causes unintimate mixing of materials and also makes the concrete porous.) The author proposes the use of Port. cement without testing. S. K.

6. Upright (lime) kilns. A. S. Klein. *Rev. Mat. Constr. Trav. Pub.*, **164,** 100–102 (1923).—Some general remarks on the opern., thickness of bed, size of raw material, massing of material during heating, height of kilns and ventilation. L. N.

7. Free lime in a Portland cement clinker. H. Passow. *Zement,* **12,** 143–5 (1923).—Quartz sand acts as an inert material when mixed with a Portland cement clinker. Blast-furnace slag when mixed with the clinker causes an increase in the amt. of free lime formed during the initial hardening. R. F. S. (*C. A.*)

8. Free calcium hydroxide in hardened Portland cement. Goslich. *Zement,* **12,** 149–50(1923).—A sample of hardened Portland cement was exposed to moist air for 6 days. It was then dried at 90° and ground to a fine powder. The sample was fractionated by a suspension analysis into the following portions: 1.78% heavier than 2.84 (sp. gr.); 40.72% between 2.84 and 2.7; 25.25% between 2.7 and 2.6; 16.53% between 2.6 and 2.44; 7.81% between 2.44 and 2.23; and 7.93% lighter than 2.23. This latter portion should contain all the free $Ca(OH)_2$, since $Ca(OH)_2$ itself has a sp. gr. of 2.078. The analyses of the fractions show that the lighter portion contains 12% excess CaO. This represents 0.95% of the total cement and indicates that free CaO is not formed during the hardening period. R. F. S. (*C. A.*)

9. How much water is chemically combined in a hardened Portland cement? Goslich. *Zement,* **12,** 163–5(1923).—Test specimens were made with 100 g. cement and 26 g. distd. water. These were stored in a moist closet. Samples were analyzed at various intervals from 1 hr. to 28 days after the mixing with water. The combined water was detd. as follows: The samples were powdered and dried to const. wt. at 90–5°. Two g. were ignited to const. wt. The loss in wt. minus the loss due to the volatile matter as previously detd. is the chemically combined water. In one cement 1.63% H_2O had combined at the end of the first hr. The amt. combined gradually increased to 13.36% at the end of 28 days. R. F. S. (*C. A.*)

10. Acid-proof cements. Anon. *Chem.-Ztg.*, **47,** 504(1923).—Water glass is a component of practically all acid-proof cements. Complete drying out and a thorough fixing of the cement after drying are essential. Usually this fixing is carried out with a dil. acid applied in repeated coats. Alkalies are harmful to these cements, and no cement is known equally resistant to both acids and alkalies. W. C. E. (*C. A.*)

11. Manufacture and application of lightweight concrete slabs. A. G. Wikoff.

Chem. Met. Eng., **28**, 975–6(1923).—A mortar is made with 3 parts of cement, 1 of sand and 7 of a material which is solid at ordinary temp. but melts in hot water. This latter material is formed into pellets before mixing with the cement and sand. The mortar is molded into slabs which are reinforced and allowed to set. After setting the pellet material is removed by heating and steam-distg. The slabs are 24 x 32 x $1^1/_8$ in. and weigh 30 lb. They are porous, strong, and resistant to the effects of heat and steam. R. F. S. (*C. A.*)

12. The properties of Portland cement. H. Burchartz. *Zement*, **12**, 186–7, 193–5(1923).—A tabulation and discussion of the results of phys. tests on 110 samples of Port. cement. R. F. S. (*C. A.*)

13. Determination of the suitable fineness of grinding of materials used in the manufacture of cement. F. Tippmann. *Zement*, **11**, 541(1922); *Chimie et industrie*, **9**, 1187(1923).—Blast 3–4 g. of the material for 10 min. in an old Pt crucible so as to form a completely fused clinker which is evenly colored a blackish green after cooling. Brown, yellow, or even white spots, observable with a magnifying glass, clearly indicate that the material was not ground sufficiently fine. If the temp. is raised above the softening point there are formed fissures having a whitish green color, which might lead to false conclusions. A. P.-C. (*C. A.*)

14. The fine grinding of cement raw mix. F. Tippmann. *Zement*, **12**, 150–1 (1923); cf. *C. A.*, **17**, 2484.—Extreme fineness is not necessary for cement raw mix. provided the clinker is thoroughly sintered. R. F. S. (*C. A.*)

15. Fineness of raw mix, strength, and impact test. H. Kühl. *Zement*, **12**, 155–8, 174–7(1923).—A review and discussion with a bibliography. R. F. S. (*C. A.*)

16. A new application of the electric furnace. Fused aluminous cement. A. Brissaud. *Science et industrie*, **6**, 83–6(1922); *Chimie et industrie*, **9**, 1187(1923).—A description of the manuf. of fused aluminous cement in the elec. furnace. Furnaces of 1,000–2,000 h. p. are used, giving 25–40 tons a day. The cement is tapped every 3–4 hrs. Power consumption is 1,000–1,400 kw.-hr. per ton. There is considerable wear of the electrodes, owing to the action of the CO_2 from the limestone, atm. O, and oxides, and mechanical abrasion during charging. (Cf. J. Bied, *Jour. Amer. Ceram. Soc.*, **4** [4], 317(1921); *Ceram. Abs.*, **2** [5], 91(1923); E. Candlot, *C. A.*, **16**, 1845.) A. P.-C. (*C. A.*)

17. The manufacture of Portland cement from marl. R. E. Kirk. Univ. Minn. Eng. Expt. Sta., *Bull.* **2**, 52 pp.(1923).—Portland cement can be made from marl and clay, of as good a quality as that made from any other raw materials. The origin of marl, its chem. compn., and the quality and quantity available in Minnesota are discussed. Plant operations are taken up in detail. R. F. S. (*C. A.*)

18. An untrodden field in lime research. O. Bowles. *Concrete* (Mill Section), **23**, 127(1923).—Limes vary greatly in their physical properties and chem. activities such as plasticity, rate of slaking, or rate of settling as milk of lime; these variations in many instances bear no relation to the chem. compn. of the original limestone. A definite relationship undoubtedly exists between the character of the lime and the physical properties of the parent limestone, but little serious effort has yet been made to correlate them. J. C. W. (*C. A.*)

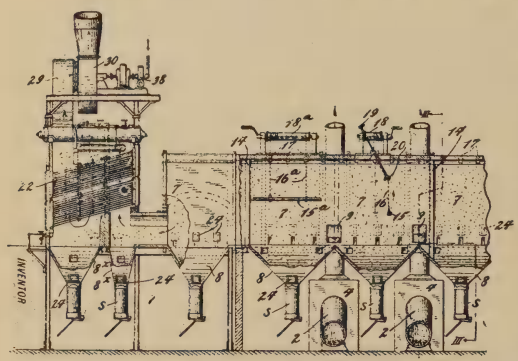
19. Energy of crystallization of calcium sulfate dihydrate, and "regenerated" gypsum. M. von Glasenapp. *Zement*, **11**, 365–7(1922).—The complete conversion of 2 $CaSO_4.H_2O$ into the dihydrate requires only a little more than the theoretical amt. of water. In consequence of the increased crystn. pressure the regenerated gypsum has a more flaky structure than the natural mineral and is also notably harder than the latter. J. S. C. I.

PATENTS

20. Artificial stone, cements, etc. H. Berry. Brit. 189,892, Sept. 13, 1921. Waste slate, coal shale, granite, broken bricks, clinker, slag, or any Al silicate, or sand, quartz, flint, or other form of SiO_2 is powd. and mixed with MgO, and with either tartaric acid or the carbonates, hydrates, or bicarbonates of Na, K, or NH_4, or mixts. of these. 1–2% of sol. silicates may be added to the alk. substances, or the finished product may be soaked in a sol. silicate soln. Traces of Ba or Sr salts, with or without NH_4 salts such as the chloride, sulfate or phosphate may be added, and an addn. of 1–2% of a sol. Mg salt, preferably the sulfate, may also be made. The magnesite is preferably calcined at 300–600° in an atm. of steam, any distillate being collected and added to the compn. A typical compn. consists of powd. slate 85, MgO 10, $^1/_2$ part of Ba compd. 0.5 and $NaHCO_3$ 5 parts. The product may be used for flooring or molded articles, or if mixed with asbestos, slag wool, or the like, as an insulating covering. Cf. *C. A.*, **17**, 2486. (*C. A.*)

21. Building brick and process of making same. Robert L. Taylor. U. S. 1,462,991, July 24. The process of making building blocks or the like consisting in first crushing ferro manganese slag to a proper consistency, mixing the mass with water to form an intimately associated plastic mixt., holding unitary portions under pressure, and then subjecting the compressed and molded units to steam and drying them, substantially as set forth. A building block or the like composed principally of ferro manganese slag.

22. Manufacture of building blocks and bricks. Frank Cordery. U. S. 1,465,115, Aug. 14. As a new article, a building block composed of dried out pulverized slag, Port. cement and magnesium chloride.



23. Cement-kiln system. David S. Jacobus. U. S. 1,463,363, July 31. App. for treating dust-laden cement kiln gases, comprising a flue arranged to permit a current of dust-laden gases to flow substantially unobstructedly therethrough without substantial change in the general direction of flow in its passage through said flue, said flue having refractory heated side walls exposed to the current of gases for the collection of a caking material, and a plurality of baffles projecting a short distance from each of said side walls at spaced intervals along the length of the flue and adapted to cause eddies in the current to bring different portions of the gases into contact with the side walls, said side walls being accessible for cleaning while the app. is in opern.

Enamel

24. Study of acid-resisting enamels. Tokiji Uchida and Kazuo Arimoto. (The Osaka Indus. Lab.), *Bulletin* **4** [1], 68 pp.(1923).—The influences of variation in the compn. of enamel-frits upon their resist. to sulphuric acid have been detd., starting from standard frits which contain basic flux (Na_2O, $^1/_3Na_3AlF_6$ or PbO), refrac. base ($^1/_3Al_2O_3$, CaO, ZnO, BaO or MgO), acid flux (B_2O_3) and refrac. acid (SiO_2, TiO_2 or ZrO_2) in the ratio of 1.0: 0.6: : 0.5: 2.4. The soly. was compared by putting 2 g. of frit with fineness of 900–1000 mesh per sq. cm. in a weighing bottle contg. 10 cc. of 10% sulphuric

acid and by leaving them for 48 hrs. at 20° C under normal press. 1. *Effect of basic fluxes on resist. to acid.* (1) Their effect is practically similar, but soda is better than cryolite or lead oxide. (2) An excess of cryolite causes difficulties in melting as it badly corrodes the pot, while too small propns. make the frit too refrac. The best result is obtained with 0.8 equivalents. 2. *Effect of refrac. base on resist. to acid.* (1) The effect is very marked. The best result is obtained with barium oxide followed by magnesium oxide. Oxides of zinc, aluminium and calcium are detrimental. (2) The series 0–1.0 $BaO.{}^1/_3Na_3AlF_6.0.5B_2O_3.2.4SiO_2$ is least sol. at 0.3BaO. 3. *Effect of acid flux on resist. to acid.* The resist. is reduced by an increase in boric acid. $0.3B_2O_3$ is most suitable, since a smaller content makes the frits too refract. 4. *Effect of refrac. acid on resist. to acid.* (1) The effect is remarkable. Only silica is satisfactory among the 3 acids. (2) The resist. increases as the content of silica rises. 5. *Effect of mutual replacement of base and acid on the resist. to acid.* (1) Expts. on series 1.0–0BaO or MgO. 2.0 $-3.0SiO_2.{}^1/_3Na_3AlF_6.0.5B_2O_3$ show that good frits are obtainable only in some definite ratios of the base and the acid, 0.6BaO or MgO: $2.4SiO_2$ being best for the series. (2) Soly. of series 0.6–1.5 ${}^1/_3Na_3AlF_6.0.9–0B_2O_3.0.6BaO.2.4SiO_2$ decreased with the content of cryolite. Considering the difficulties caused by its corrosive action on pot, the propn. 1.0 ${}^1/_3Na_3AlF_6$: $0.5B_2O_3$ seems to be most suitable. 6. *Production of the best frit.* Since the expts. hitherto described have indicated that Na_2O, B_2O_3, BaO and SiO_2 are most desirable constituents of acid-proof enamels, the authors then started to find their best propn., keeping the ratio of fluxes and refract. oxides at 1.3:3.7 in equivalents and also the contents of soda and boric acid as 1.1 and 0.2 respectively. The best frit thus obtained is $0.3BaO.3.4SiO_2.1.1Na_2O.0.2B_2O_3$. The frit loses only 0.28% in the test, and is quite satisfactory in other respects, such as melting point, burning luster, burning color and adherence to iron. S. K.

25. Study of cast iron enamels. YUTAKA FUKUDO. (The Osaka Indus. Lab.), *Bulletin* **4** [2], 43 pp.(1923).—The process of enameling cast iron ware in single coat is described. 1. *Raw materials used in the expts.* Cast iron pieces contg. 2.51% carbon, 1.99% silicon, 0.10% sulphur, 0.06% phosphorus and 0.34% manganese were employed. Enamel materials were quartz, red lead, cryolite, soda-ash and sodium nitrate. 2. *Effect of cast iron.* Four kinds of cast iron, ranging in the content of carbon from 2.58 to 3.13% gave almost same results for same glazes. 3. *Effect of fusibility of enamel.* 510°C is the most suitable m. p. for the purpose. 4. *Effect of coeff. of expansion.* Expts. with 35 diff. batches show that enamels with expansion-coeff. of 0.0000220–0.0000280 are most suitable. 5. *Effect of opacifier.* Cryolite makes an enamel fragile when it is used in excess of 15%. If stannic acid is used, it should be introduced to an enamel when its frit is ground. 6. *Effect of glazing process and time of firing.* Employing an enamel as $\left\{\begin{array}{ll} 0.112\ Na_2O & \\ 0.337\ PbO & 1.242\ B_2O_3, \\ 0.551\ {}^1/_3Na_3AlF_6 & 1.526\ SiO_2 \end{array}\right\}$ composed of 25 quartz, 20 red lead, 40 boric acid, 10 cryolite and 5 sodium nitrate, the author got the best results when the enamel was fired at 750–770°C for 30–10 secs. after applying its dry powder on hot test pieces, previously heated at above temps. for 2–4 mins., or when the enamel was fired at 800–820°C for 40–10 secs. after applying its powder on hot test pieces which had just been heated at the same temps. for 1–3 mins. 7. *Surface-treatment of cast iron body.* Surface-decarbonization of cast iron prevents the bubbling of enamel. A very excellent result was obtained with test pieces which had been coated with ferric oxide, manganese dioxide or sodium nitrate, placed in a muffle, heated to 850°C and then cooled very slowly. 8. *Colored enamel.* The batch described in 6 gave excellent colored enamels when suitable amts. of colorants had been used. For example, 3 copper oxide, 3 chromium oxide, 3 manganese dioxide and 0.5 cobalt oxide pro-

duce a light sky blue, a dark green, a dark brown and an indigo blue respectively.
S. K.

26. Correct notions on fluoride enamels. CHARLES MUSIOL. *Chimie et industrie*, **9**, 872–87(1923).—A mathematical criticism of the theories of Vogt, Gruenwald, and Mayer and Havas (*Sprechsaal*, **1911**, No. 1) based on the analyses published by these authors. It is shown that F is not volatilized as SiF_4, that when B_2O_3 is present F is probably volatilized as BF_3 (this would require to be confirmed by analysis of the gases evolved), and that Mayer and Havas' results abound in errors, either clerical or analytical. A method is given for calcg. the compn. of the enamel from that of the initial mixt. Seger's formula is worse than useless. The relationship between the various constituents should be studied by means of the centesimal mol. compn.
A. P.-C. (*C. A.*)

27. The effect of enamel on the transmission of heat. A. H. GIBSON, F. C. LEA AND EZER GRIFFITHS. *Repts. Light Alloys Sub. Comm., Advisory Comm. for Aeronautics*, No. **5**, 61–90(June, 1921); *J. Inst. Metals*, **28**, 632.—The rate of flow of heat from a rough cast Al surface to the air or to water is considerably improved if the surface is coated with a smooth enamel. A large no. of tests showed that the best results are obtained with a hard, smooth, stoved enamel, which increases the rate of transmission of heat from a rough cast Al alloy surface to air by 15% and to water by 4 to 8% from cast iron to air by 7% and from steel to air by 2%. No effect is produced on Cu.
H. G. (*C. A.*)

PATENTS

28. Pickling bath for iron. O. VOGEL. U. S. 1,460,395, July 3. A pickling bath for Fe is formed of H_2SO_4 or other acid soln. contg. about 1% quinoline or one of its derivs. to prevent the metal from becoming brittle. (*C. A.*)

29. Removing rust from metals. J. S. GRAVELY. U. S. 1,459,910, June 26. Rust is removed from articles of ferrous metal or Ni-plated ware by treating them with a soln. of NH_4 citrate or other org. NH_4 salt, and then, after a lapse of time, washing off the slime produced. (*C. A.*)

Glass

30. Color given to glass by tungsten. KITSUZO FUWA. *J. Jap. Cer. Assoc.*, **370**, 302–9(1923).—Coloring action of sodium para-tungstate ($Na_{10}W_{12}O_{41}.28H_2O$), tungsten trioxide and metallic tungsten on glasses with formulas of $R_2O.RO.3SiO_2$ and $R_2O.RO.0.5B_2O_3.3SiO_2$, also effect of oxidizing agent and arsenious acid on the action of the sodium tungstate have been studied. Results of 142 meltings and effect of reheating these glasses are described. *Results.* (1) Sodium tungstate or tungsten trioxide mixed in glass-batches produces no particular color. (2) Metallic tungsten produces very often a yellow or an orange in glass. Similar coloration is rarely observed when sodium tungstate or tungsten trioxide is used. Metallic tungsten gives often a gray to glass. Melting of a batch with metallic tungsten will result in the production of a system as $xW + yWO_3 + zNa_2(K_2)WO_3$ + glass. Presence of the yellow oxide will color the glass yellowish. Suspension of tungsten or its blue oxide will give a gray to the glass. (3) Sodium tungstate has a tendency of producing alabaster effect or opacity, especially in glasses free from boric acid. The tendency is also observable in metallic tungsten and its oxides, though it is very weak. The phenomenon is probably due to fine suspension of tungsten oxides. (4) Sometimes, an excess of tungsten salts, its oxides or metallic tungsten produces gall on surface of glass or massive ppt. at the bottom. They consist of sol. tungstates of alkali metals. (5) Introduction of sodium tungstate accompanied by an oxidizing agent or arsenious acid produces no

particular color. (6) Salts or oxides of tungsten can be used as opacifiers but not as colorants. S. K.

31. Manganese compounds as glass colorants. KITSUZO FUWA. *J. Jap. Cer. Assoc.*, **366,** 80–97(1923).—Coloring action of manganese compds. on various glasses have been studied. Formula of basal glass was $R_2O.RO.3SiO_2$, $R_2O.RO.0.5B_2O_3.3SiO_2$ or $1.3R_2O.RO.6SiO_2$ in which R_2 and R represent Na or K and Ca, Mg, Zn, Ba or Pb respectively. Results of 591 meltings with 100–150 g. or 1 kg. batch are described. 1. *Manganese dioxide.* According to MEYER and ROETGERS, this oxide is dissociated into Mn_2O_3 at 530°C in air. Generally speaking, soda-glass has pink shades and is not so clear as potash-glass, although these differences disappear at higher intensities. PbO encourages the coloring. It is very likely that MnO_2 is decomposed to $xMn_2O_3 + yMnO + zMnO_2$ in the melting. The propn. of these 3 oxides and also the color are affected by the constituents of glass. 2. *Manganous oxide.* Almost colorless, yellow or blue glass is obtained when such amt. of MnO which will produce light purple or pink with MnO_2 are used. 3. *Manganous carbonate.* Its action is similar with that of MnO. Thus the pink or purple does not owe to MnO, but to higher oxides, probably Mn_2O_3. 4. *Manganese dioxide and nitrate of potash or soda.* These nitrates favor the coloring in most cases. 5. *Manganese dioxide and potassium tartrate.* The reducing agent counteracts to the dioxide in most glasses. 6. *Manganese dioxide and arsenious acid.* Arsenious acid acts generally to reduce the coloration of MnO_2 markedly. 7. *Manganese dioxide, arsenious acid and nitrate of potash or soda.* The colors seem to be affected by complex reactions which occur in melting. MnO_2 remaining in the resulting glass will produce a brown and Mn_2O_3 will color it pinkish purple or purple, while MnO has no coloring action. S. K.

32. Coloring action of molybdenum on glass. KITSUZO FUWA. *J. Jap. Cer. Assoc.*, **367,** 129–31(1923).—Action of molybdenum as glass colorant was studied by adding 1.0–7.5% of ammonium molybdate to 20 different glasses with formulas of $R_2O.RO.3SiO_2$ and $R_2O.RO.0.5B_2O_3.3SiO_2$. *Results.* (1) Molybdenum causes no particular coloration; (2) glass with molybdenum has very often been opacified by reheating. This property is closely related with its compn.; (3) the molybdate in excess of about 5% is sepd. as white gall on its surface or as grains at its bottom; they are chiefly composed of alkali molybdates. S. K.

33. Color imparted to glass by chromium. KITSUZO FUWA. *J. Jap. Cer. Assoc.*, **368,** 192–6(1923).—Coloring action of chromium on glasses with formula of $R_2O.RO.3SiO_2$, $R_2O.RO.0.5B_2O_3.3SiO_2$, $1.3R_2O.RO.6SiO_2$ or $R_2O.B_2O_3.6SiO_2$ is reported. Chromium has been introduced in the forms of Cr_2O_3, $K_2Cr_2O_7$ and K_2CrO_4. Influence of potassium nitrate and potassium tartrate on color given by Cr_2O_3 has been studied. *Conclusions.* (1) Generally speaking, chromium compds. impart yellowish green colors to glasses. Compn. of glass affects its shade in yellow; *i. e.*, 0.05% of Cr_2O_3 introduced in batches as such give a green to $Na_2O.CaO.0.5B_2O_3.3SiO_2$, while $Na_2O.CaO.3SiO_2$ is colored light yellowish green. (2) Colors given by $K_2Cr_2O_7$ are richer in yellow than those given by Cr_2O_3, K_2CrO_4 being intermediate in this respect. (3) Addn. of oxidizing agent to a batch contg. Cr_2O_3 encourages the yellow tint, while reducing agent acts to reduce it. It may owe to green coloration by Cr_2O_3 and a yellow one by CrO_3, or it may be ascribed to the action of these agents on iron oxides. S. K.

34. Color given to glass by vanadium. KITSUZO FUWA. *J. Jap. Cer. Assoc.*, **369,** 236–40(1923).—The influence of compn. of glass on its color given by vanadium oxide, V_2O_5, which was added to batch with or without oxidizing agent (potassium nitrate), reducing agent (potassium tartrate) or arsenious oxide, has been detd. The basal glass was $R_2O.RO.3SiO_2$ or $R_2O.RO.0.5B_2O_3.3SiO_2$. The results can be summarized as follows: (1) Generally speaking, color given to glass by vanadium oxide resembles

that imparted by Cr_2O_3, though the latter has stronger tint in yellow than the former. (2) The color is not influenced by compn. of glass. In general, boric acid encourages the coloration. (3) Oxidizing agent added to batch causes a slight increase in yellow, while reducing agent and arsenious acid tend to act the other way. Color of vanadium glass may chiefly owe to V_2O_3 and this may be partly oxidized to V_2O_5 which may be a yellow colorant of glass. (4) V_2O_5 can be used for Cr_2O_3, though it is too expensive for usual purpose. S. K.

35. Color given to glass by antimony oxide. KITSUZO FUWA. *J. Jap. Cer. Assoc.*, **369**, 241–2(1923).—Coloring action of antimony oxide on glass was studied by introducing 10–30% of Sb_4O_6 to glasses with compn. of $1.3R_2O.RO.6SiO_2$ and $R_2O.B_2O_3.6SiO_2$ with the result that the oxide does not cause any particular coloration, and also that reheating of glasses, which have high contents of antimony oxide, in a gas-fired kiln usually produces iridescent effect, light grayish black to black in color, on their surface. S. K.

36. On the thermal expansion of soda-lead glass. JIRO MORI. *J. Jap. Cer. Assoc.*, **368**, 176–80(1923).—Linear expansion of soda-lead glass, completely free from stress, has been detd. at 30° and 100°C. The max. difference between the observed linear expansion and that calcd. by the aid of SCHOTT'S coeff. amts. to 12%, while they agree very well only in glasses whose formulas are close to $6SiO_2.1.0PbO.1.0Na_2O$. The author has obtained the following coeff. for linear expansion for lead oxide and soda, taking 0.05, 1.53, 1.53 and 0.45 as those of silica, lime, alumina and magnesia resp.: PbO 0.938 and Na_2O 4.70. The next tables show chem. compns. and coeffs. of linear expansion of glasses used in the expts.

TABLE I.—ANALYSES OF THE GLASSES

No.	PbO	Na_2O	Al_2O_3	CaO	MgO	SiO_2
10	44.73	4.61	0.72	0.07	0.05	49.82
8	41.83	5.61	1.23	trace	.09	51.21
6	39.24	6.90	1.14	0.10	trace	52.61
4	37.45	7.88	0.96	.10	0.03	53.58
2	36.60	8.27	.97	.06	trace	54.10
0	33.96	10.02	1.09	.08	0.01	54.84
1	31.57	11.35	1.15	.04	.02	55.87
3	28.01	12.40	0.98	.09	trace	58.52
5	24.33	13.83	1.19	.33	0.02	60.30
7	22.94	14.06	1.15	.18	trace	61.67
9	16.35	16.34	1.15	.14	0.07	65.95

TABLE II.—FORMULAS AND LINEAR COEFFICIENTS OF EXPANSION

No.	Formula	Observed coeff. $666(\times 10^{-8})$	Calcd. coeff. $678(\times 10^{-8})$	Diff. $+8(\times 10^{-8})$
10	$6SiO_2.1.5PbO.0.5Na_2O$			
8	$6SiO_2.1.4PbO.0.6Na_2O$	705	704	— 1
6	$6SiO_2.1.3PbO.0.7Na_2O$	729	739	+10
4	$6SiO_2.1.2PbO.0.8Na_2O$	761	764	+ 3
2	$6SiO_2.1.1PbO.0.9Na_2O$	781	776	— 5
0	$6SiO_2.1.0PbO.1.0Na_2O$	844	836	— 8
1	$6SiO_2.0.9PbO.1.1Na_2O$	880	877	— 3
3	$6SiO_2.0.8PbO.1.2Na_2O$	903	892	—11
5	$6SiO_2.0.7PbO.1.3Na_2O$	934	933	— 1
7	$6SiO_2.0.6PbO.1.4Na_2O$	929	929	0
9	$6SiO_2.0.5PbO.1.5Na_2O$	966	975	+ 9

The coeff. is on the whole a function of chem. compn. However, as indicated in the latter table, it does not follow the additive law exactly. This fact causes diffs. which are a little larger than exptl. errors. S. K.

37. Cracking and corrosion of glass pots. SANGORO TAKAHASHI. *J. Jap. Cer. Assoc.*, **367,** 149–53(1923).—Descriptions or discussions on life of pots due to cracking, manner, cause and prevention of cracking, life due to corrosion, its manner, cause and prevention are given with photographs. According to statistics for 3 yrs. at the Tokio Elec. Co., most of cracks in covered pots have grown vertically at their inside. This kind of cracking is probably caused by the side pressure of molten glass which favors the growing of vertical minute cracks produced together with those of other directions during the period of filling. Sometimes they are cracked in various directions inside or outside of pot, usually during the period of tempering the pots in pot-arch or before filling batch in the placed pots. Pots should be tempered at least to 1300°C. Corrosion by usual batch contg. 50% of raw materials was far more severe than that by simple cullet batch, indicating that pots are chiefly corroded by fluxes in raw materials before complete melting which takes about 10 hrs. Iron contd. in batch and pot is detrimental in regard to corrosion, especially for lead glass, because it produces metallic lead and ferrous silicates. Excess of flux in raw materials or use of arsenious acid causes sometimes honey-combed corrosion. As conclusion, the author recommends the use of porous pots lined with such a material which will produce sillimanite on using. S. K.

38. On the test of chemical glasses. TORAO KATO. *J. Jap. Cer. Assoc.*, **367,** 138–49(1923).—Detailed descriptions are given on the existing specif. for glass vessels for use in chem. lab. Then the results of an elaborate expt. with beakers and various flasks made by several Jap. manuf. are described. As conclusions, he proposes the adoption of the foll. methods in the testing of chem. glasses. Preliminary treatment: Wash the sample with distilled water after rinsing it well with a soln. of potassium bichromate in concd. sulphuric acid. 1. *Tests for endurance of sudden heating.* (1) Heat the vessel at least to 120°C in an air bath and then immerse it neck foremost in water of 15°. (2) Boil the vessel contg. conc. soln. of calcium chloride whose sp. gr. is 1.33 at 15° for 5 min. on an asbestos plate and immerse it in water of 0°. (3) Put the vessel which has been $^3/_4$ filled with paraffin on an asbestos plate heated by a bunsen burner, take off the heat source, read the temp. and dip it in water of 15° for a moment. The process should be repeated every 5° till it is cracked. Mean value of about 3 samples must be reptd. for temp. over about 160°. 2. *Tests for resistance to water and reagents.* (1) *Water.* Boil distilled water in the vessel which is kept three-quarters full with it for 6 hrs. Loss in wt. should be expressed in mg. per 100 sq. cm. (2) *Acid.* The vessel three-quarters filled with 12% HCl is kept boiling for 3 hrs. The loss is expressed as described above. Its appearance must be inspected. (3) *Alkali.* Same to (2), except that 2% soln. of NaOH is used as reagent. 3. *Test for dissolved alkali.* The water obtained in the test B (1) is tested by rosolic acid for the presence of alkaline reaction. *Standards.* 1. *Endurance of sudden heating.* (1) The neck must remain uncracked. (2) The sample should stand the test. (3) The breaking temp. must be over 140° in beakers and conical flasks and over 130° in round flasks. 2. *Resistance to water and reagents.* (1) *Water.* The max. allowable loss is 5 mg. (2) *Acid.* The max. allowable loss is 5 mg. The testing must cause no change in the appearance. (3) *Alkali.* The max. allowable loss is 30 mg. The boiling must cause no change in the appearance. 3. *Dissolved alkali.* No alkali must be detected. S. K.

39. The staining and etching of glass. L. SPRINGER. *Glasshütte*, **52,** 289; **53,** 277(1922–3). See *Ceram. Abs.*, **2** [2], 23(1923). J. B. P. (*C. A.*)

(1923).—The mixing, shaping, firing and polishing are described. J. B. P. (*C. A.*)

40. Flattening stones. C. J. STAHL. *Glashütte*, **53,** 307, 323–5, 339–41, 355–6

41. The electrodeposition of silver and copper on glass. C. H. Proctor. *Glass Ind.*, **4**, 61–3(1923). J. B. P. (*C. A.*)

42. Graphic check on glass-works operation. Walter J. Knothe. *Glass Ind.*, **4**, 83–5(1923). J. B. P. (*C. A.*)

43. Avoiding errors in the analysis of glass sand. J. B. Krak. *Glass Ind.*, **4**, 103–4(1923). J. B. P. (*C. A.*)

44. The basic glasses industry. A. Bigot. *Chimie et industrie*, **9**, 851–62(1923).—A review of the prepn., properties and uses of artificial basic silicates, describing more particularly B.'s methods and equipment and the properties of his products. A. P.-C. (*C. A.*)

45. An electric furnace for the melting of quartz goods. W. Schuen. *Keram. Rundschau*, **31**, 12(1923); *J. Soc. Glass Tech.*, **7**, 47; cf. *C. A.*, **17**, 2176.—Quartz was melted to a cylindrical mass round an electrically heated carbon tube. At the stage of development attained, only pieces of quartz so shaped could be worked and then by processes adapted from the glass industry. The elec. resistance consisted of a tube of 1 m. length, 35 mm. external diam., and 25 mm. internal diam., made of the purest electrode C. At each end of the tube an electrode consisting of a thick block of C was adjusted to make good elec. contact with it. The electrodes were surrounded by strong Fe bands, and the cables were joined to the electrodes by detachable strong Fe connecting pieces. The resistor and electrodes were built into a furnace capable of rotation. The furnace consisted of a strong Fe cylinder lined with a glazed fire-clay cylinder. Asbestos was placed between the Fe shell and the electrodes to prevent short-circuiting. Only a. c. could be used. The voltage was 40 and the current 800 to 1000 amp. In 20 minutes 18 to 23 kg. of sand could be melted with a current consumption of 7.5 to 8 kw./hr. Sketches of the furnace are given. A piece of waste quartz tube was slipped over the carbon resistor. Sand was then filled in to such a height that the top electrode could not rest on the edge of the furnace but rested on top of the sand. The silica and the carbon reacted, with the formation of Si carbide and CO_2. Any gas developed could escape only with difficulty and so a protective layer was formed between the glowing resistor and the soft quartz. To counteract the high gaseous pressure, a hand-operated lever was used to maintain elec. contact between the resistor and the electrodes. The melting process was concluded in 20 to 30 minutes and then the quartz had to be worked quickly. H. G. (*C. A.*)

46. Gas-producer heat balances. W. B. Chapman. *Glass Worker*, **42** [39], 11, 18, 20(1923); *Glass Ind.*, **4**, 123–6(1923).—A pyrometer recording the sensible heat of the producer gas is recommended as an aid to correct producer operation. A heat balance is offered as a tentative standard compiled from tests of 12 different installations of mech. producers of 4 different makers. J. B. P. (*C. A.*)

47. The action of water and steam under pressure on some soda-lime-silicate glasses. P. W. Hodkin and W. E. S. Turner. *J. Soc. Glass Tech.*, **6**, 291–308 (1922).—Four soda-lime-silicate glasses having the approx. compns. $6SiO_2.0.3CaO.1.7Na_2O$, $6SiO_2.0.7CaO.1.3Na_2O$, $6SiO_2.0.8CaO.1.2Na_2O$, and $6SiO_2.CaO.Na_2O$ were subjected to the action of water and steam at pressures varying from 2 to 25 atms. above normal. The action of steam on these glasses is considerable, being greater than that of water at the higher pressures in the case of the glass having the lowest lime content. Corrosion diminishes as the amt. of lime is increased and the amt. of Na_2O decreased. The glass with the highest lime content was unattacked by steam or water in 3 hrs. at 2 to 4 atms. The incrustation formed as a result of corrosion was harder the greater the lime content; a gelatinous layer was formed beneath the incrustation on the glass contg. only 0.3 CaO at 15 atm. pressure. Since the loss in weight recorded was less

than the total alkali found in the water, it is clear that the glass absorbs a considerable quantity of water. The character of the corrosion, which clearly brings out pouring and molding lines, is influenced markedly by the condition of the surface. The autoclave test is considered too severe for soda-lime-silicate glasses which are only required to resist the action of boiling water. Cf. *Ceram. Abs.*, **1** [12], 329(1923).

J. C. S. (*C. A.*)

48. The diphasic nature of glass, as shown by photo-elastic observations. L. N. G. Filon and F. C. Harris. *Proc. Roy. Soc.* (London), **103A,** 561–71(1923); 3 figs., tables.—A specimen of flint glass was heated slowly to 400° and then subjected to a longitudinal pressure of 130.6 bars. The full load was left on for 42 hrs. and then the specimen was allowed to cool slowly under this pressure; the process took 7 hrs. The load was removed and the specimen examd. in Na light between cross Nicols with the aid of a Babinet compensator. The black band indicated a stress difference which was quite considerable and remained of the same sign throughout a cross-section of the specimen. This band extended up to the edge, excluding a possible "skin effect" as the source of a balancing stress. The conclusion, after a mathematical analysis of the results, is "that a portion of the stress is not optically shown. It necessarily follows that the material cannot be homogeneous, but must consist of at least 2 components or 'phases.'" "Further these phases must have different stress-optical coefficients." The stress-optical coeff. for the heavy flint glass in question only changed from 2.31 brewsters to 2.24 brewsters during the above treatment. "It would thus appear that the heat treatment has produced practically no change in the concn. of the disperse phase, so that the phases have not sepd. out, but have been present in the glass from the beginning." An extra-dense flint examd. in the same manner gave positive values for the longitudinal stress, whereas these values were negative in the case of the heavy flint glass. From the above fact, the conclusion is that the "crypto-stress" is an effective pressure in the case of the extra-dense flint. It is suggested that according to Wieners' hypothesis if the particles of the disperse phase are small compared with the wave-length of light, the double refraction due to stress would be largely influenced by change of shape and orientation of the dispersed particles. Further expts. are in progress.

G. E. B. (*C. A.*)

49. The action of potassium carbonate on lead glass. H. D. Richmond. *Analyst,* **48,** 260–2(1923).—A sample of K_2CO_3 taken under the Sale of Food and Drugs Acts showed 10 parts of As and 80 parts of sol. Pb per million. Scrapings from the walls of the same bottle gave 12 pts. As and 500 pts. Pb per million. The bottles contained 0.34% of As_2O_3 and 13.1% PbO. It was proved by expt. that K_2CO_3 contg. 16.6% of moisture gave no increase of lead content in six weeks when kept in a "well closed lead-glass bottle." A sample of K_2CO_3 originally carrying less than 5 pts. per million of lead stored for 9 weeks in a lead-glass bottle with "very imperfect" closure contained 20.5% moisture and 150 pts. per million of lead at the end of the time. The result is attributed to the formation of a liquid phase on the surface of the crystals which acts on the bottles. It is recommended that K_2CO_3 be not stored in lead-glass bottles.

G. E. B. (*C. A.*)

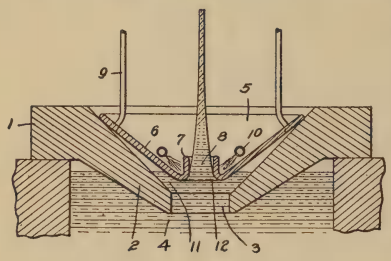
50. Chemical glass and hard glass. Ad. Lecrenier. *Bull. federation ind. chim. Belgique,* **1922,** 225–34; *Chem. Zentr.,* **1922,** IV, 30.—Besides numerous data on the glass works of the Val St. Lambert, the formation and properties of hard glass are explained, with emphasis on the importance of careful cooling to obtain the lowest possible coeff. of expansion. On cooling the rate of decrease of strain is proportional to the square of the strain. This relation is derived mathematically. From measurements of many types of glass the coeffs. of expansion for the following substances were calcd.: SiO_2 0.8, B_2O_3 0.1, PbO 3.0, MgO 0.1, Na_2O 10.0, K_2O 8.5, CaO 5.

C. C. D. (*C. A.*)

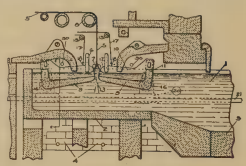
PATENTS

51. Thermo-resistant glass. C. J. VAN NIEUWENBURG. (Holland.) Brit. 200,020, 1922. In the manuf. of thermo-resistant glass, lithium-alumino-silicate, preferably as lepidolite, is added to the ordinary materials, with the addition of a subs. such as zinc oxide or boric acid compd. which promotes the melting process. The glass produced has an increased tensile strength with a resultant increased coeff. of thermal endurance. (*Chem. Trade Jour. & Chem. Eng.*) O. P. R. O.

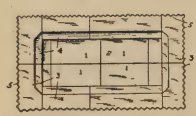
52. Drawing glass sheets. HALBERT K. HITCHCOCK. U. S. 1,463,582, July 31. The process of drawing a glass sheet which consists in chilling a body of glass between the laterally extending walls of a pair of slot members, lying one above the other, in a melted bath of glass, anchoring the base of the glass sheet to said chilled body of glass, and drawing the sheet through the slot of the upper slot member, such upper slot member being of metal and acting as a die, and the lower slot member being of clay.



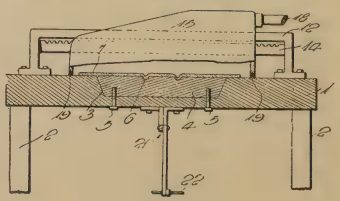
53. Drawing continuous sheet glass. LEONARD D. SOUBIER. U. S. 1,463,273, July 31. In a sheet glass drawing apparatus, a tank containing molten glass, means for drawing a sheet of glass therefrom, a container within the molten glass for segregating that portion of the glass from which the sheet is drawn, the container being divided, substantially in the plane of the glass sheet, into two similar sections, and means for bodily moving the sections toward and from one another to vary the width of the passage therebetween.



54. Glass-handling apparatus. FRANK O'NEILL. U. S. 1,462,652, July 24. A glassware manufacturing apparatus comprising traveling sectional molds, driving means to bring a pair of molds into opposing relation open toward each other, and means carried with one of the molds providing a guide toward the other mold, one of said open molds having a pair of ware engaging shiftable members mounted on the guide, means for engaging an article in one mold, shifting said article out of said mold by travel of the members along the guide means and member coacting means releasing the article into the other mold by opening of the members. Glassware apparatus comprising a traveling carrier, a mold, a rotatable mounting for the mold as to the carrier including a gear, a stationary rack in the line of travel of the gear for rotating the gear, driving means for the carrier providing a station of rest for the mounting, a device movable relatively to the stationary rack and including a toothed section operable to disengage the gear at said station of rest and slow up carrier travel of the mounting as leaving the rack and reaching said device.



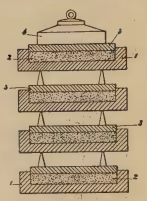
55. Glass-melting tank. HARRY G. WILLETTS. U. S. 1,462,993, July 24. A glass-melting tank having its lateral walls containing refractory bricks, some having one face provided with ribs, the latter being on the outer surface of said tank.



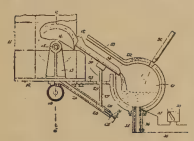
56. Method and machine for constructing embossed glass plate. HARRY F. ANDERSON. U. S. 1,465,507, Aug. 21. The herein described method of forming an embossed sheet of glass consisting in placing a pallet upon a die, forming soft

glass into a thin sheet upon said pallet, drawing said pallet from beneath the sheet of hot glass to allow the sheet of glass to settle upon the die while still hot and in a workable condition, immediately placing a hood over the sheet of glass, and forcing fluid under pressure into said hood to cause the sheet to conform in shape to the die.

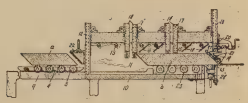
57. Manufacture of articles of glass and the like. MARCEL ARMAND DEMONGEOT. U. S. 1,465,545, Aug. 21. The process of producing a finished molded article from granular or powdered vitrifiable material in a manner to prevent sticking to the mold which consists in placing the material in the mold, raising it while in the mold to a temperature sufficient to soften it but lower than that which would cause sticking to the mold and, while it is being so heated in the mold, subjecting the material to an external pressure acting progressively during the heating operation so as to consolidate the mass in spite of its relatively low temperature.



58. Gathering and delivering apparatus for molten glass. ALLEN CHARLES WILCOX. U. S. 1,465,886, Aug. 21. In apparatus for gathering and delivering molten glass, a main tank, an auxiliary tank, a rotatable gathering disk having a portion extending into said main tank below the normal level of the molten glass, means for rotating the disk, an inclined trough having its lower end positioned to deliver to the auxiliary tank and its upper end positioned to effect removal of the glass gathered on the disk into the trough for conveyance to the auxiliary tank, means for heating the interior of the auxiliary tank, an extension on the auxiliary tank above and parallel to the trough whereby the hot gas from the auxiliary tank will pass over and heat the glass being conveyed by the trough, and means for delivering glass from the auxiliary tank to a glass working apparatus.

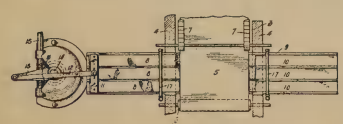


59. Process of and apparatus for forming glass. ROBERT M. CORL. U. S. 1,465,347, Aug. 21. The process of manufacturing sheet glass comprising applying a melting heat to a localized portion of a set mass of glass to flow therefrom a sheet of lesser thickness than the mass, advancing the mass to compensate for the flow of glass therefrom and to maintain a substantially fixed relation between the source of heat and the surface of the mass to which the heat is applied, and successively removing predetermined quantities of glass from a supply of molten glass, permitting them to chill to set condition and successively attaching them to the rear end of the glass mass from which the sheet is flowing and thereby maintaining the continuity of the mass and the flow of the sheet therefrom.



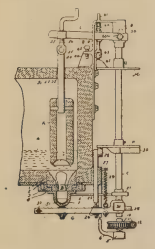
60. Manufacture of heat-insulating articles. JAMES H. DELANY. U. S. 1,464,698, Aug. 14. The improvement in the manufacture of articles having heat-insulating properties due to a vacuum hermetically sealed in glass, which comprises the production, within their interior sealed spaces, of such vacuum as the sole result of the condensation of a gas or vapor confined therein.

61. Sheet-glass-drawing mechanism. THOMAS S. OWENS. U. S. 1,462,495, July 24. In a sheet-glass-drawing mechanism, a chamber through which glass is drawn in sheet form, a table disposed at one side of a soft portion of the sheet and extending transversely thereof and through and beyond each side wall of the chamber, a sheet flattening member guided by the table for movements transversely of the sheet in flattening contact with a surface thereof and being of a length for one end portion to extend without a side of the chamber when another end portion thereof is disposed in rubbing contact with the surface of a

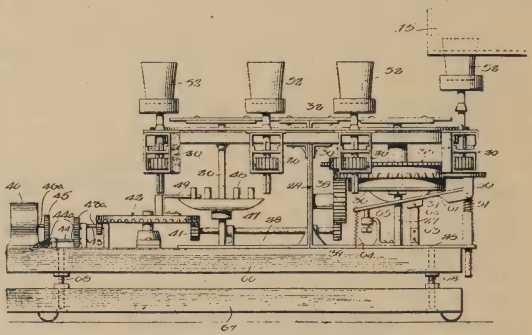


sheet, means without the chamber for imparting reciprocatory movements to the member, and means for cooling each end portion of the flattening member when disposed without a respective side of the chamber.

62. Process and apparatus for feeding glass. WILLIAM J. MILLER. U. S. 1,462,491, July 24. In the feeding of glass, for use in connection with a container for molten glass provided with a discharge orifice, the combination of means intermittently operative for detaching the glass protruding from said orifice to form gathers, a receptacle adapted to contain a quantity of liquid, means for applying said receptacle to the outer end of said orifice between detaching operations whereupon the liquid is gasified by the heat, causing the glass to be temporarily retracted along said orifice for the purposes described, and means for replenishing the supply of liquid to said receptacle when the latter is in its inoperative position, said replenishing means being adjustable to regulate the quantity of liquid supplied to said receptacle. See *Ceram. Abs.*, **2** [8], 177(1923).



63. Glass finishing and polishing machine. GROVER CLEVELAND SCOTT. U. S. 1,462,522, July 24. A machine of the character described including a table, a carrier movable around and upon the table, upright shafts, one of which is rotatable, carrier actuating members on the shafts, a gear wheel loose on the other shaft, means for intermittently rotating the first shaft and thus moving the carrier, means for constantly rotating said gear, a vertically shiftable member adjacent to the gear, a cam rotating with the gear for actuating said shiftable member, a plurality of glass holders each having a stem movable with the carrier above said shifting member, and a gear splined on the stem and engageable with the first named gear, and a frame on the carrier for each holder, in which the holder stem is journaled to rotate and shift vertically, and in which the gear of said stem is freely rotatable and confined against vertical shifting movement with the stem, and a vertically adjustable support for said mechanism consisting of a platform on which the mechanism is mounted, and a base with which the platform is adjustably associated.



64. Glass. SOC. ANON. QUARTZ ET SILICE. Brit. 190,476, Dec. 8, 1922. Fused SiO_2, transparent and free from bubbles, is made by agglomerating the raw material, reduced to fine powder, with gelatinous SiO_2 and then compressing it into molds of the desired shape at a pressure of about 200 kg. per sq. cm. The molded mass is next heated to about 150°, to get rid of moisture, and is then fused in an elec. furnace. Agglomeration of the raw material is facilitated by first transforming it into crystobalite by heating to about 1500°. (*C. A.*)

65. Glass. SOC. ANON. QUARTZ ET SILICE. Brit. 190,477, Dec. 8, 1922. To obtain fused quartz free from bubbles, compact siliceous rocks of a high degree of purity and preferably contg. no micro-cryst. cement are melted. The rock is cut into cylinders which are perforated axially so that they can be threaded on the C electrode of the furnace. (*C. A.*)

66. Glass. BRITISH THOMSON-HOUSTON CO., LTD. Brit. 189,926, Oct. 6, 1921.

Shaped articles, rod, or tube of transparent SiO_2 are made by fusing the SiO_2 under atm. pressure, cooling, reheating the SiO_2 to a plastic state, and then molding to a desired form, or extruding through a die, by applying pressure. The SiO_2 is first freed from bubbles by melting it *in vacuo* and subjecting it to pressure in the manner described in 188,451. A suitable construction is specified. (*C. A.*)

Heavy Clay Products

67. Bricks from oil shale. ANON. *Indus. Aust. & Min. Standard*, **70**, 132(1923).—Experiments are being made in Ger. to produce bricks from oil shale cheaper than clay bricks. One process mixed shale with cement or lime and subjected it to hydraulic pressure, but was not entirely satisfactory. Another process which has been tried successfully at the Prussian Geol. Survey and at several brickworks is as follows: the shales, after the pyrites has been sepd. from them by sifting, are ground up with a propn. of clay or sand which varies according to the richness of the shales, and the powdered mixt. is then molded into bricks, which are put straight into the kiln without being dried. No fuel is required to burn them, as the inherent content of oil in the shales suffices for that purpose. Bricks made in this way are said to be slightly lighter in color than ordinary bricks, but to be no different in appearance otherwise. O. P. R. O.

68. Silica (Sweden). ANON. *Brit. Clayworker*, **32**, 137(1923).—Deep and extensive deposits of silica have recently been discovered in the province of Scania, Sweden; the presence of some 20% of bituminous matter in this silica gives greater value to the discovery, as with such raw material no intermediary processes are necessary, the material as it is brought up being simply pressed into wall, floor and roof tiles of a very high standard of quality. Silica of this kind is to be found nowhere else in the world, the discovery is consequently unique as well as extremely valuable. The total yield is estd. at 800,000 cu. m., the whole being easily accessible at a depth of 5 m.; sufficient to keep all the Scand. countries in building tiles for generations, and leave a margin for export. A new method for the production of tiles in large quantities by special machinery has now been patented, whereby the tiles are at the same time impregnated against damp. These patents, together with the silica deposits, have been taken over by a Swedish building material concern; arrangements have been made to produce 100,000 sq. m. dampproof tiles per yr. O. P. R. O.

69. Firing of building brick in Hoffmann kilns. M. FERNAND WATTEBLED. *Brit. Clayworker*, **32**, 71(1923).—A résumé of a valuable tech. monograph by Wattebled of Paris. The rept. is issued by Sociéte d'Encouragement pour l'Industrie Nationale. According to the raw materials used, the temps. at which the requisite chem. actions are correctly completed may vary from 700 to 1400°C, but max. results are obtained by firing at the highest allowable temp. which will not destroy the color or shape of the goods. The first condition is to ascertain the temp. of gases of combustion and maintain it. This is done by direct measurement and by calcn. The former method requires expensive instruments. By calcn., however, it is possible to det. the temp. of gases at the exact moment of their formation before any loss by cooling occurs. W. describes how he perfected an instrument for taking samples of the gases of combustion simultaneously from a large number of points in a Hoffmann kiln in full fire and was enabled to obtain definite confirmation of a series of calcns. worked out to show the actual reln. between temp. and carbonic acid content. A fuel of known calorific value was used throughout the expts. He illustrates his points by diagrams and tables. They show that to obtain the max. useful effect from the combustion of fuel in a kiln, it is essential that the production of carbonic acid should be constant and correspond with the amt. showing the production of the firing temp. of the goods. There are 4 distinct zones in the process of firing: (1) that which comprises chambers of goods in process of

cooling; (2) that in which combustion of the fuel takes place; (3) that in front where green goods are being heated; (4) that in which goods are being set and drawn. Intermittent firing causes a considerable loss of time and heat and is obviously not the most satisfactory. The phenomena which occur in the firing zone are discussed at length by means of tables and diagrams, the calcns. being based on 9 rows of feed holes. The ideal temp. curve is shown in the diagram and the conclusion is that in order to attain it in the burning of a Hoffmann kiln mech. continuous feeding is essential. A mech. feeding device must satisfy the following conditions: (1) Possibility of varying the speed of the whole installation. (2) Coördination of the working of all the units of fuel distribution. (3) Possibility of varying the rate of feed of each individual unit according to its position on the kiln, while the general movement is coördinated. (4) A type of machine that can deliver to the feed-holes very small but strictly regular quantities of fuel. Instantaneous combustion of the fuel is essential and is insured by fine pulverization, and by the fact that the fuel falls unimpeded through a certain height in the interior of the kiln. The heat value of the flame of a number of different types of fuel is as follows: (Amounts in degrees C.) Oak wood, 1865; peat (dry), 2020; lignite, 1960; long flame coal, 1960; anthracite, 2030; coke dust, 2018; locomotive ashes, 2029; colliery duff, 68% ash, 1635. Inferior fuels can be successfully used if finely pulverized, the author has proved by firing more than 100 T. of bricks at 1000°C every 48 hrs., in a kiln burning only locomotive ashes. The exhaustive researches of W., have laid the foundation of a vaulable tech. advance in the large scale practice of brick firing. O. P. R. O.

70. Specifications for building and sandlime brick in Austria. ANON. *Tonind.-Ztg.*, **47**, 492–3(1923).—*Building brick.* (1) *Definition.* All fired brick made of clay, loam, or clay-like material together with sand, broken quartz rock, dry clay powder, or fired clay are classed as building brick. (2) *Kinds.* Brick are divided into the following classes depending upon their compress. strength: (*a*) clinker (*b*) hardfired brick (*c*) common brick. (3) *Compress. strength.* The av. compress. strength made upon at least 10 specimens should be at least above the foll. values: (*a*) clinker = 600 kg./qcm. (*b*) hardfired brick = 300 kg./qcm. (*c*) common brick = 120 kg./qcm. Brick which do not meet these specif. should be called "underfired." (4) *Shape.* Building brick should have a true shape and should correspond to the following dimensions: Large size brick—29 cm. long, 14 cm. wide, and 6.5 cm. high. Small size brick—25 cm. long, 12 cm. wide, and 6.5 cm. high. (5) *Absorption.* The absorption will be tested as follows: At least 5 bricks should be dried until they no longer lose wt. after which they are weighed. They are then immersed in water and allowed to remain there until they no longer absorb water. The increase in wt. above the dried brick should be less than the following: (*a*) clinker = 2% (*b*) hardfired brick = 8%. The absorption for common brick is not limited but is usually above 8%. (6) *Resist. to freezing.* Clinker, hardfired brick, and brick used as front brick and for facing must be resistant to the freezing test. The freezing test is conducted in the foll. manner: About 10 brick are immersed in water in a hole at least $^1/_2$ cbm. or in a tank of corresponding size, 25 times, being frozen to a temp. of at least 4°C each time for at least 4 hrs. and then allowed to heat up to room temp. *Sand lime brick.* (1) *Definition.* All brick made from a mortar-like mixt. of a high quartz and low feldspar sand and lime which has been pressed and treated with steam at a pressure of 8 atms. are known as sand lime brick. (2) *Kinds and compress. strength.* Hard sand lime brick must have an av. compress. strength of at least 120 kg./qcm., this being the av. of at least 10 specimens. Sand lime brick not meeting these specif. are known as medium hard. (3) *Shape.* The shape corresponds to that of clay brick. They should be true and correspond to the following dimensions: Large size brick: 29 cm. long, 14 cm. wide, and 6.5 cm.

high. Small size brick: 25 cm. long, 12 cm. wide, and 6.5 cm. high. (4) *Absorption.* The absorption of water is not limited but as a rule should be between 11 and 17%. (5) *Other requirements.* (*a*) Upon being struck they should have a clear ring. (*b*) The fracture should have a uniform structure and should be free from lime grains and holes; the presence of large pieces of silica are admissible. H. G. S.

71. Manufacture of hand molded sand-faced brick and tile. ANON. *Brit. Clayworker*, **32**, 112–3(1923).—Different methods of setting brick and tile in kilns are described. H. G. S.

72. Modern tile making. ANON. *Brit. Clayworker*, **32**, 100–2(1923).—The raw materials used for making tile are described. Sawdust is used in the manuf. of filter tile and for others which are required to be extremely porous. It is a mistake to use soft wood sawdust for this purpose as the particles are too coarse, sawdust from hard-wood is in every way preferable, as well as producing much finer pores. H. G. S.

73. Microscopic structure of common brick. SEIJI KONDO. *J. Jap. Cer. Assoc.*, **370**, 283–91(1923).—Structure of common brick manufd. at the 2 biggest plants in Tokio and Osaka districts is reptd. Their chief raw materials are loams in Tokio and stoneware-clays in Osaka, small propns. of sand being used at both plants. Their mineral compns. are given. The brick are made with spiral presses and burned in ring kilns. They are classified into 8 grades in Tokio and 6 in Osaka. Quality of the brick is as follows:

	Tokio		Osaka	
	Grade 1	Grade 8	Grade 1	Grade 6
Absorption in 48 hrs.	9.94%	18.17%	6.66%	14.60%
Porosity	27.04%	36.87%	22.93%	32.29%
Crushing strength (kg. per sq. cm.)	554	139	595	162

1. *Structure of the Tokio brick.* Thin sections of brick, which were fired at cone 09a–05a in a ring kiln in Tokio, show plagioclase, quartz, impure dehydrated clay, hypersthene, orthoclase and very small amts. of microcline, hornblende and fragments of groundmass. Hypersthene has slight sign of fusion even in the grade 8. Plagioclase in the grades 1–5 and orthoclase in grade 1 show similar signs. The grades 1–5 have slight amts. of glass. 2. *Structure of the Osaka brick.* Thin sections of brick, which were fired at cone 05a–03a in a ring kiln in Osaka, contain quartz, impure dehydrated clay, orthoclase, radiolaria quartzite, plagioclase and slight amts. of microcline, hypersthene, hornblende and biotite. Plagioclase in all grades, hornblende in the grades 1–5 and quartz, orthoclase as well as microcline in the grades 1–4 are melted in varying degrees. Even the grade 6 contains a small quantity of glass. The grades 1–4 have considerable amts. of sillimanite. 3. *Min. compn.* Approx. min. compns. of the brick have been calcd. from their analyses under assumptions that the brick have only 7 constituents as described below and also that hypersthene has a definite compn. as $3MgO.2FeO.5SiO_2$.

Brick	Orthoclase and microcline	Albite	Anorthite	Hyperthene	Dehydrated clay	Quartz	Ferric oxide
Tokio	10.5	15.0	15.8	13.0	17.0	23.6	5.1
Osaka	13.0	6.6	2.4	3.6	18.7	52.1	3.6

4. *Formation of glass.* Of the Tokio brick, the grades 1–3 contain small amts. of colorless and light brown glasses, while the grades 4 and 5 have only light brown glass. Of the Osaka brick, the grades 1–3 have considerable amts. of light brown glass with many cracks and bubbles and also cracked colorless glass which appears to be filling most of voids in the thin sections, diam. of these glasses being often as large as 1.1–

1.5 mm.; the grade 6 has only a small amt. of light brown glass. The facts that quartz, feldspars and the other minerals were melted at such low temps. and also that considerable amts. of glass were formed may probably owe to the presence of minute particles of various minerals and their products of decompn., which would compose very fusible mixts. non-uniformly distributed all through the body. These eutectic mixts. will melt at first in the firing and the glass will act on grains of quartz and the other minerals to dissolve them. Large colorless glasses in thin sections of the Osaka brick have often regular outlines or small nuclei of quartz or feldspars. 5. *Formation of sillimanite.* The grades 1–4 of the Osaka brick have considerable amounts of sillimanite. Many crystals in the grade 1–4 are as long as 0.05–0.02 mm. Twelve micro-photographs are given. S. K.

74. The heat-insulating power of structural material. H. BURCHARTZ. *Tonind.-Ztg.*, **46,** 713–4, 721–2; *Chem. Zentr.*, **1922,** IV, 701.—Expts. were made on sand-lime brick with the heat-insulation tester of Gary-Dittmer. Its high heat-insulation capacity is due to its porosity and quartz content. Sand-lime brick can be ranked with other brick in regard to this property. C. C. D. (*C. A.*)

PATENT

75. Channel brick. ARTHUR HARDONCOURT. U. S. 1,463,697, July 31. A channel brick having two substantially parallel channels which are relatively deep and leave only webs between the bottom of the channels and the bottom of the channel-brick, corrugations on the channel brick at the inner sides of the channels, the channel brick at the outer sides of the channel being curved downwardly and inwardly to the inner sides of the channels so that the channel brick at the channels will be strong and the channels at their upper portions will be relatively narrow while sufficient to permit a mason to introduce his fingers while partially closed into one of the channels without striking his knuckles against the outer walls of the channels, the channel brick having load-bearing portions between and at the outer sides of the channels.

Refractories

76. The Derbyshire Silica Firebrick Co. works at Frieden. ANON. *Brit. Clayworker*, **32,** 113–4(1923). H. G. S.

77. Setting a Lancashire boiler. ANON. *Brit. Clayworker*, **32,** 119(1923).—Special blocks for setting boilers are described. H. G. S.

78. On refractory cement. TEI TAKAMATSU AND MASATAKE KUWAYAMA. *J. Jap. Cer. Assoc.*, **368,** 167–75(1923).—The authors have worked for the production of substitutes for "hytempite" which is imported from America. Hytempite has alk. reaction, its strength corresponding to 0.0276 g. NaOH per g. of sample. Analysis of dried sample is: Total silica 68.66, sol. silica 4.33, alumina 16.26, ferric oxide 2.60, lime 1.25, magnesia 0.92, soda 3.73, and loss on ignition 6.53%. It melts at about cone 15, while its insol. portion has a refractoriness of cone 27. The effect of adding different amts. of water glass to the insol. portion of hytempite, 7 kinds of domestic clays and a diatomaceous earth on their refractoriness are shown; the results indicate a close similarity between Mizuno clay and the insol. portion of hytempite. The expts. of mfg. refractory cement with Mizuno clay, grog and water glass are reptd. Analyses of these materials are:

	SiO_2	Al_2O_3	Fe_2O_3	CaO	Mg	Na	Ignition loss
Mizuno clay	69.12	16.68	0.55	1.80	0.99	...	8.20
Grog	73.20	21.84	.90	1.24	.83	...	...
Water glass	36.56	...	....	....	....	18.81	44.63

Two small slabs cut from fire brick were cemented with each mixt. The blocks were then heated at 1350°C (for 8 hrs.), 1580° (100 hrs.), 1510° (104 hrs.), 1470° (110 hrs.), 1490° (113 hrs.) and 1345° (10 hrs.). Then they were tested as cements for cracked glass pots. The foll. mixts. together with several others are at least as good as hytempite:

No.	Mizuno clay	Water glass	Grog	Water
20	30	15	55	9
42	30	25	45	5
43	25	25	50	5

S. K.

79. Jointing materials for refractories. D. Jones and W. Emery. *Foundry Trades Jour.*, **28,** July 12(1923).—The authors devised expts. to test the effect of mixt. in various propns. of fire clay, ganister and crushed silica brick (grog), and in some cases the effect of adding certain compds., *e. g.*, plaster, lime, and sodium silicate to the mixts. The mat. were first thoroughly mixed in the dry state, and water was then added to the proper consistency. A layer about 3 in. thick was spread between two 2-in. cubes prepd. from hand-make silica brick. When air-dried, the samples were fired to cone 16 in an elec. fur. under load of 50 lbs. per sq. in. The temp. was raised for 3 hrs. to cone 16 and then maintained constant for 1 hr. In order to provide a more drastic test, some mixts. were heated to cone 20 under the same load. Briquettes were also made from the mixts. and tested for contraction or expansion, crushing strength and resist. to slag-penetration. It was found that mixts. of fire clay and ganister have much greater expansion than those of clay and grog, but on the average these mixts. have a greater crushing strength and much higher resist. to slag-penetration. Although jointings of clay-ganister mixt. lack adhesive power, they are very hard and firm compared with clay-grog mixts., which are deficient in mech. strength and are crushed out when fired under load. Clay-grog mixts. especially such as have the latter component in excess, are badly attacked by slag. These briquettes have open texture with large pores into which the slag freely penetrates. Clay-ganister mixts. sinter more readily than clay-grog mixts., and a clay-ganister mixt. of 1:1 softens so much that, heated to cone 16 under load, the cement is squeezed out. It was found that an admixt. of fire clay, ganister and grog gave the best results. In 2 mixts. a fat, plastic ball clay was added in slip form instead of ordinary fire clay, and one was found to be exceptionally good in all respects. Compared with a mixt. using fire clay, with ganister and grog in the same propns., the mech. strength was more than doubled and resistance to slag-penetration greatly increased. The jointing was very hard and firm, and even when fired to cone 20, the cement was still good. (*Bull. Cleveland Tech. Inst.*, **1923,** July.) O. P. R. O.

80. Refractory silica materials of S. Wales, with special reference to the influence of texture. W. R. R. Jones. *Trans. Ceram. Soc.* (England), **21,** 358–93(1921–2).—Microscopical examn. indicated that quartzites suitable for use in the manuf. of silica bricks should consist of angular grains set in a siliceous cement in optical continuity with the quartz grains, and should contain some chert or crypto-cryst. silica, but little non-siliceous matter. They should show a wave-like extinction of the quartz grains. The crushed silica rocks and sands were graded by sieving and by the elutriation of the material passing through a 30-mesh sieve. The results obtained gave further evidence of the similarity of the materials used in S. Wales for the manuf. of silica brick. Test-pieces molded with water from the raw materials and without the addn. of any bonding material were heated to 1350° and their cold crushing strengths subsequently detd. It was seen that the finer the grade of the material the higher was the compressive strength of the test-pieces. The drying shrinkage was small, while a further shrinkage of about 0.2% was found after firing to 1000°, but the brick began

to show expansions after burning at 100°. The sp. gr. of the brick decreased with successive firings, the rate of conversion of the quartz increasing with the fineness of the material. J. S. C. I.

81. Requirements of a refractory mortar. R. F. Lindsay. *Chem. Met. Eng.*, **28,** 1080(1923).—A refractory mortar must have a m. p. close to that of the brick with which it is used. The expansion and contraction of the mortar and also its chem. properties should be similar to those of the brick. W. H. B. (*C. A.*)

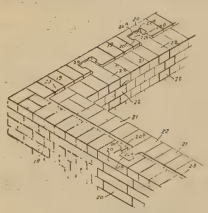
82. The melting point of coal ash. F. S. Sinnatt, A. B. Owles and N. Simpkin. *Colliery Guardian*, **125,** 1131(1923).—A new method for detg. the m. p. of coal ash, used successfully for 4 yrs., is described. A small compact furnace of MgO brick is bored through the center to take a SiO_2 tube. A vertical hole at right angles serves for heating the SiO_2 tube with an oxy-coal gas burner beneath the brick. Detns. are made with 0.2 g. of ash, prepd. in thread shape. Ash from coal from different horizons in the same seam varied considerably in m. p., showing the need of careful sampling. Certain bands in a seam had a very high m. p. (over 1440°) compared with the bulk of the seam. No relation was found between m. p. and chem. compn. C. C. D. (*C. A.*)

83. Properties and testing of refractories. R. Rieke. *Gas u. Wasserfach*, **66,** 33–6, 53–5, 66–8(1923). J. L. W. (*C. A.*)

PATENTS

84. Crucibles, retorts, etc. Ferolite, Ltd. and H. B. Clapp. Brit. 189,692, Feb. 7, 1922. Crucibles, retorts, and other vessels for high temp. work are molded from a mixt. of chromite and ferro-Si with a binding agent such as Na silicate soln. Cf. 183,219. (*C. A.*)

85. Treating alunite. E. Moldenke. U. S. 1,457,787, June 5. Finely divided alunite is treated with more than sufficient H_2SO_4 to convert the Al into sulfate, forming a paste, the mixt is heated until it forms a brittle cake and after the material is disintegrated it is introduced into a closed chamber and heated to cause evolution of fumes from the free acid present and render the values sol. in H_2O. The heating and hardening of the pasty mixt. may be carried out on a sheet-metal flexible conveyor the flexing of which serves to break the caked material and dislodge it from the conveyor. Clay and bauxite when treated with H_2SO_4 may be similarly handled. (*C. A.*)



86. Furnace wall. Michael Liptak. U. S. 1,463,044, July 24. A wall structure made up of a main masonry outer wall and a replaceable inner facing wall, one of said walls including blocks having lock head seats with entrance throats leading thereto, and the other wall including blocks having necks formed with lock heads, said heads being insertable into and removable from interlocking engagement with said seats by movement in the wall in the space between immediately adjacent lower and upper layers of blocks or brick. (Cf. *Ceram. Abs.*, **2** [9], 196(1923).)

87. Furnace wall. Michael Liptak. U. S. 1,463,050, July 24. A composite furnace wall comprising a permanent masonry outer wall having therein horizontal rows of sill-forming blocks, overlying horizontal rows of lintels and intervening pilasters, forming vertically spaced rows of horizontally spaced pockets, in combination with a high refractory replaceable masonry inner wall including shelf-forming blocks projected into and anchored within the pockets of said permanent wall.

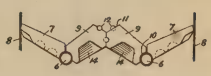
88. Partition wall for furnaces. Michael Liptak. U. S. 1,463,051, July 24. A composite partition wall for furnaces comprising a permanent center wall and shelf-forming elements anchored to and projecting from opposite sides of said wall and replaceable facing walls anchored to said center wall by said shelf-forming elements.

89. Furnace wall. MICHAEL LIPTAK. U. S. 1,463,052, July 24. A composite furnace wall comprising a permanent masonry outer wall having therein horizontal rows of sill-forming blocks, overlying horizontal rows of lintels and intervening pilasters, forming vertically spaced rows of horizontally spaced pockets, in combination with a high refractory replaceable masonry inner wall including shelf-forming blocks projected into and anchored within the pockets of said permanent wall, said shelf-forming blocks each being substantially the width of a coöperating pocket.

90. Furnace wall. MICHAEL LIPTAK. U. S. 1,463,053, July 24. A composite furnace wall comprising a permanent masonry outer wall having horizontally spaced pilasters and intervening pockets, in combination with a high refractory inner wall including shelf-forming blocks that project into the pockets of said permanent outer wall, said shelf-forming blocks comprising outside and intermediate sections, the former having interlocking engagement with said pilasters and being held interlocked therewith by the intermediate lock sections.

91. Furnace wall. MICHAEL LIPTAK. U. S. 1,463,058, July 24. A wall structure made up of a masonry outer wall and a replaceable inner wall, said outer wall including tile anchor boxes and said inner wall including shelf-forming blocks extended into and anchored within said anchor boxes, said anchor boxes being rectangular, the bottom portions thereof affording sills and the top portions thereof affording lintels and the end portions thereof affording pilasters in the outer wall, said anchor boxes being horizontally divided and set with their pocket-forming portions aligned but with their pilaster-forming end portions offset so as to form staggered joints between the upper and lower box-forming sections.

92. Fire-brick arch. ALFRED H. WILLETT. U. S. 1,463,184, July 31. A tube supported fire brick arch construction comprising a series of pairs of invertible brick supported between two tubes, said brick in each pair being inclined toward and resting against each other and each brick having at the meeting end two oppositely inclined supporting surfaces constructed to permit the brick to be rested against each other either face upward. See *Ceram. Abs.*, **1** [5], 142(1922); *ibid.*, **1** [7], 185(1922).



93. Arch brick. GUY CARLETON DENNEY. U. S. 1,463,156, July 31. An arch brick member having along one edge an arch brick support engaging surface and having on its opposite edge a cut back portion having an inclined end surface and a projecting portion having an oppositely inclined end surface, the planes of said surfaces not intersecting within the body of the member and said portions being complementary whereby when a pair of such members are assembled in reversed relation they coöperate to form a brick, said inclined end surfaces being serrated or roughened.

Terra Cotta

94. Roofing tile industry in Ishikawa prefecture. KYOTARO KOYAMA, TOMOZO ISHIDA AND YOSHITAKA NAKAMURA. *J. Jap. Cer. Assoc.*, **369**, 243–54(1923).—Only glazed roofing tiles are produced in the prefecture. The body is composed of 1 or 2 kinds of local clays with or without addn. of sandy clay or sand. Eight kinds of clay, each used as sole body mat., have compn.: silica 59.49–67.77, alumina 13.46–20.21, ferric oxide 3.53–7.52, lime 0.51–4.41, magnesia 0.06–2.21, alkalies 0.03–0.82 and loss on ignition 7.60–16.16%. Body is prepd. by kneading its mat. with or without aid of pug mill and clay cutter. No machine is used in the forming. The tiles are glazed after biscuit-firing. Glazes are composed of local rock, ferric oxide and pyrolusite, sometimes with addn. of galena. Now they are fired in semi-continuous kilns called

"Noborigama" at cone 6a–9. All samples taken from 17 manufacturers have perfectly stood the usual test for freezing. Their absorption in 48 hrs. ranged from 3.4 to 17.7%.

S. K.

Whiteware

95. Improvement of the firing procedure for whiteware kilns. E. REUTLINGER. *Ber. der Deut. Keram. Gesell.*, **4** [1], 1–35(1923).—The results of several firings in a small coal fired kiln of 6 cu. m. vol. and in several industrial kilns of 45–170 cu. m. vol., are given in graphs and tables. The object of the expts. was to find the best firing procedure using as little coal as possible. All temp. were measured both with thermocouples and cones. The gases were analyzed both with the Orsat and recording instruments, and a continuous draft record was taken. The ideal curve for the biscuit burn in the small kiln is (1) raise temp. to 100°C the first hr. (2) raise rapidly at 350°C rise per hr. for 2 hrs. to 800°C (3) raise slowly for 7–8 hrs. at 40–60°C rise per hr. to 1150°C. The ideal curve for the glost burn is (1) raise temp. 230°C per hr. for 3 hrs. to 700°C (2) raise at 120°C per hr. for 3 hrs. to 1050°C (3) hold at end temp. for: $^1/_2$–1 hr. The curves for the industrial kilns naturally show a longer burning time. In these kilns a good biscuit burn on small ware will use from 0.25–0.40 lb. of coal per lb. of ware + sagger burned, and for the glost burn, 0.20–0.25 lb. of coal per lb. of ware + sagger. In firing large sanitary ware, 2–3 times this amt. of coal will be used. The larger the vol. of the kiln, the less coal per unit of vol. is used. The importance of kiln design in order to diminish temp. differences and shorten burning time is emphasized, and expts. are now under way along this line. By connecting together several kilns having a single chimney and using the heat from a cooling kiln to warm up a cold kiln, a saving of 15–20% in the amt. of coal used is possible. See *Ceram. Abs.*, **1** [8], 214(1923). E. N. B.

96. Chemical porcelain. G. N. WHITE. *Trans. Ceram. Soc.* (England), **21**, [4], 320–7(1921–2).—The resistance to fracture, in consequence of abrupt changes in temp., of heterogeneous supercooled fluids, of which hard porcelain is a type, is in general raised by conversion as far as possible into the cryst. state. This requires the bulk of the Al_2O_3 in porcelain to have crystd. out as sillimanite. The formation of sillimanite is the more complete the lower the proportion of bases present, although a certain proportion of bases is essential to the formation of sillimanite. The practical problem is therefore to det. the minimum propn. of bases which gives under practicable time-temp. treatment a totally impermeable body. The relative resist. to fracture of porcelain was detd. by heating test-pieces in a bath of molten $NaHSO_4$ at a definite temp. and then transferring rapidly to a bath of eosin soln. J. S. C. I.

97. The production of porcelain for electrical insulation. III. F. H. RIDDLE. *J. Am. Inst. Elec. Eng.*, **42**, 631–5(1923); cf. *Ceram. Abs.*, **2** [9], 199(1923).—China and ball clays are tested for fired color, porosity, fineness of grain, and strength. Particular emphasis is placed upon the grain size of quartz, for which water sepn. is recommended. Limits of compn. are wide but the quality depends on the compn. Special spark-plug porcelains are made by eliminating feldspar and quartz and substituting synthetic calcines. Firing first drives out the H_2O then the feldspar melts and dissolves the clay and quartz or assists these to change into sillimanite and free SiO_2. The soln. of quartz depends upon the grain size and heat treatment Ordinary porcelain has a tensile strength of 3000–6000 lbs. per sq. in. and a coeff. of linear expansion of 4–9 $\times 10^{-6}$ per °, while special porcelain may reach a strength of 12,000 lbs. and a coeff. of 2.7 $\times 10^{-6}$.

W. E. R. (*C. A.*)

98. Experiments on the low-temperature final firing of porcelain. W. FUNK. *Sprechsaal*, **55**, 312–3; *Chem. Zentr.*, **1922**, IV, 700–1.—The expts. were carried out at cones 8–9 in the compn. range specified by Hertwig-Möhrenbach. In general the stability of the porcelains was not great. C. C. D. (*C. A.*)

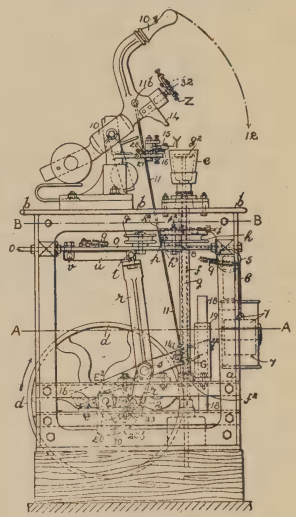
99. Stoneware as material for the construction of apparatus and machines. C. HEINEL. *Chem. App.*, **10**, 85–7, 93–5(1923).—A mathematical consideration, with 7 charts and tables, of some of the properties of stoneware, such as flexibility, compressibility, porosity, heat cond., expansion, resist. to internal and external pressure, etc.
J. H. M. (*C. A.*)

BOOK

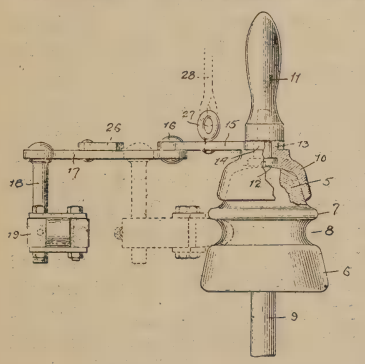
100. The A. B. C. of English Salt-Glaze Stoneware, from Dwight to Doulton. J. F. BLACKER. London: Stanley Paul & Co., 15s. net. Reviewed in *J. Roy. Soc. Arts*, **71**, 565(1923). (*C. A.*)

PATENTS

101. Machine for use in the manufacture of teacups, breakfast cups, beakers, and other vessels or articles of pottery. ELIJAH BROOKES. U. S. 1,465,577, Aug. 21. In a pottery machine, a chuck for holding the article provided with a vertical driving shaft, a lever pivoted to rock in a horizontal plane and provided with a knife for cutting off the upper part of the article when revolving with the chuck, an arm pivoted to work in a vertical plane and provided with a projection which operates the said lever when the arm is lowered, and a rounding tool carried by the said arm and engaging with the rim of the article after its upper part has been cut off by the knife.



102. Apparatus for shaping insulators. LORENZO C. BUCKLEY. U. S. 1,465,157, Aug. 14. A shaping tool for pin type insulators, comprising a cap adapted to fit in the head of a preformed insulator blank, and a lateral shaper pivoted with relation to the cap and adapted to bear against the side of the blank during its rotation.



103. Washtub. M. HAGAMAN. U. S. 1,462,573, July 24. A wash tub having bottom, front, back and end walls, and a hollow imperforate box-like projection extending rearwardly from the inner upper portion of the face of the front wall and provided with an inclined rubbing surface on the rear side thereof, said boxlike projection being of less width than the width of the front wall and of less depth than the depth of the tub, whereby said projection is spaced from the opposite ends of the tub and from the bottom of the tub.

Equipment and Apparatus

104. The A. E. G. optical pyrometer. ANON. *Brit. Clayworker*, **32**, 108(1923).—The A. E. G. instrument is a simplified form of the Holborn-Kurlbaum pyrometer. It registers temps. between 650° and 1500°C to within an accuracy of ±5°. It is based upon the principle of the disappearing filament, and is extremely simple in construction.

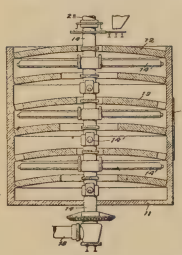
It consists namely of central optical tube, in the forepart of which a carbon filament lamp is fixed. This tube is encased within a second, which carries a double wound, non-inductive resistance coil. A 3rd protective tube, upon which is the temp. scale, covers the resistance tube. In addn. this outer tube is fitted with a slide, which is in contact with the resist. The instrument is provided with a grip, which is held in the left hand, the right being free to manipulate the slide. The pyrometer is graduated in accordance with the voltage of the supply cable; variation in the voltage, therefore, must be allowed for in making exact measurements. The temp. correction for a variation of one volt is given on the slide. For instance, if, in using a 220-volt pyrometer, the correction for which is ± 2 per volt, the voltmeter registers 220 volts, the true temp. will be 4 higher than that indicated on the scale. These instruments are made to operate on both a. c. and d. c. circuits up to 220 volts; for an a. c. circuit of over 220 volts, a transformer is necessary. For voltages up to 190, the pyrometer may be coupled up directly with the supply cable. H. G. S.

105. A proposal for the establishment of a new scale of hardness for glass and crystals. BERNHARD HALLE. *Deut. opt. Wochschr.*, **8**, 98–100; *Chem. Zentr.*, **1922**, IV, 101.—After a short summary of older methods and app., a modification of the method of Rosiwal is described. Instead of a definite amt. of abrasive being used until it becomes useless, it is continuously renewed and that used is sepd. out. It is assumed that the hardness is proportional to the loss in wt. under fixed conditions. The abrasive and the necessary liquid (usually H_2O, but olive oil for diamond and EtOH or C_6H_6 for H_2O-sol. crystals) are enclosed in a 2-section shell and the latter is so rotated that the sample is given a cycloidal motion. The used abrasive is scraped from the lower section of the shell; emery or carborundum is used for soft materials, diamond for hard. C. C. D. (*C. A.*)

106. The new precision pycnometer. B. BERGDAHL. *Chem.-Ztg.*, **47**, 530(1923).—The neck of the app. is cut off obliquely. The stopper has a hole bored from the lower end which passes through the side at a point just above the low side of the oblique neck. The stopper is inserted in the filled app., the excess liquid flows out through the hole in the stopper which is then turned to close the hole. J. H. M. (*C. A.*)

107. New hardness tester. ANON. *Iron Steel Can.*, **6**, 145–8(1923).—A description is given of the Herbert pendulum hardness tester recently invented in England. This instrument gives direct and rapid readings of hardness and can be used for testing the hardness of substances ranging from Pb to sapphire. V. O. H. (*C. A.*)

108. Engineers develop pocket viscometer. ANON. *Nat. Petroleum News*, **15** [30], 92–4(1923).—A pocket viscometer consists of 2 bulbs, one carrying a standard liquid and the other the liquid to be tested. Viscosity in Saybolt sec. is read directly by the rate at which a sphere falls through each liquid. The accuracy of the instrument runs as high as 99% with an experienced operator. D. F. B. (*C. A.*)

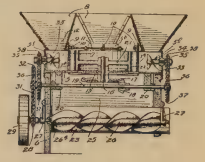


PATENTS

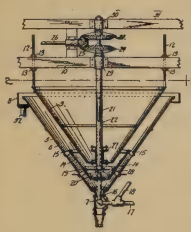
109. Rabble-furnace construction. BENJAMIN G. CALL. U. S. 1,465,417, Aug. 21. In a device of the class described, the combination of a rabble arm provided with a guide supporting member extending lengthwise thereof, a plurality of rabble guides slidably mounted on said member, adjacent sides of contiguous guides being provided with rabble supporting means, and a plurality of rabbles, each supported by said means between the contiguous guides whereby any pair of adjacent guides may be separated to permit the removal of the rabble carried thereby without affecting the mounting of the other rabbles.

110. Percentage feeder and mixer. ANGUS D. MACLELLAN. U. S. 1,462,649,

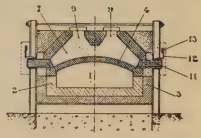
July 24. In a feeder of the class described, the combination with a base plate having recesses in its outer periphery, a wheel journalled to said plate, means between said recesses delivering different material laterally to said plate, and means on said wheel for conducting the material to said recesses.



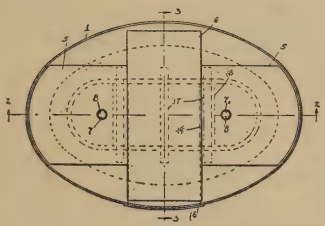
111. Ore concentrator. JOHN I. MULLEN. U. S. 1,465,143, Aug. 21. In an ore concentrator, the combination of an outer cone and an inner cone forming an annular channel for grading ore-particles carried in an aqueous medium into concentrates and tailings, an overflow conduit disposed to receive material passing across the upper edge of the outer cone, an intermediate cone dividing the lower portion of the channel into receiving and discharge compartments, means revolving in opposite directions in said receiving compartments for agitating the pulp, and means for receiving pulp to and discharging pulp from the respective compartments.



112. Electric furnace. MARIUS SAUVAGEON. U. S. 1,464,543, Aug. 14. An electric furnace, comprising a hearth the crown wall of which is formed of material which is a good conductor of heat and at high temperatures a good conductor of electricity, a series of heating chambers above said crown wall, granular resistance material filling said heating chambers, and electrodes extending into said chambers and contacting with said granular material. Cf. *Ceram. Abs.*, **1** [11], 279(1922).



113. Electric furnace. CHARLES A. CADWELL. U. S. 1,464,496, Aug. 14. In an electric furnace, the combination of an elongate furnace chamber; electrodes extending downwardly into such chamber one at each end; a resistor within said chamber lying on the floor thereof between said electrodes; and a muffle chamber supported at its ends in the respective side walls of said furnace chamber so as to lie over said resistor and between said electrodes, said muffle chamber being composed of a plurality of carbon rods plastered over with a layer of suitable heat-resistant material.



Kilns, Furnaces, Fuels and Combustion

114. The draft in rotary kilns. A. HEISER. *Tonind.-Ztg.*, **47**, 492(1923).—The damper in most fur. is usually left in one position owing to lack of knowledge of how to use it. H. describes the use of a draft gage to meas. draft in rotary kilns. By means of this gage the static and dynamic press. are recorded. Dynamic press. is the highest press. produced by a gas in motion and is represented by the following formula: $dp = YW^2/2g$ in which W is the velocity of the gas, Y the sp. gr. of the same, and g is the acceleration due to gravity which is 9.81 m. per sec. The total pressure pg is the algebraic sum of the static press. $pg = pst + pd$. If one meas. the total press. and the static press. in the same cross-section, the following holds true:

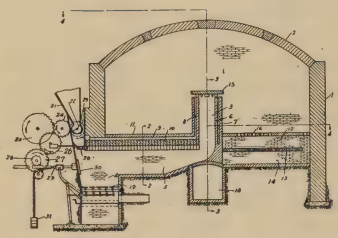
$$\frac{YW^2}{2g} = pg - pst, \; W = \sqrt{\frac{2g(pg - pst)}{Y}} \text{ m./sec.}$$

An instrument made by the Schultze Co. (Berlin-Neukölln) is described. H. G. S.

115. A novel coal elevator. ANON. *Brit. Clayworker*, **32**, 108(1923).—An elevator for hoisting wheel barrows full of coal from the ground up to the top of a Hoffmann kiln is described. H. G. S.

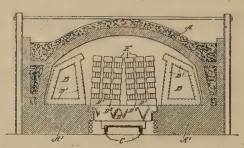
116. Coal distributors. ANON. *Brit. Clayworker*, **32**, 106–7(1923).—Coal distributors for feeding powdered coal into Hoffmann kilns are described. In hand feeding the burner visits and charges each feed hole about once every 20 min. The temps. rise considerably after each feeding causing fluctuations in temp. and overheating near the floor of the kiln. In the hand feeding of Hoffmann kilns it is difficult to get sufficient heat to the crown of the kiln. Most of these troubles can be overcome by using automatic pulverized coal feeders for introducing the coal. In this feeder the powdered coal is fed in minute rapid repeating quantities which raises the temp. of the kiln gradually, does not overburn the bottom, and causes the top to become as thoroughly heated as the rest of the kiln. Damage to brick lining of the feed holes is almost entirely prevented. The economy in fuel resulting from the use of this method was found to be from 20 to 30% over hand feeding. It is also claimed that lower grade fuels can be used in this method of feeding. H. G. S.

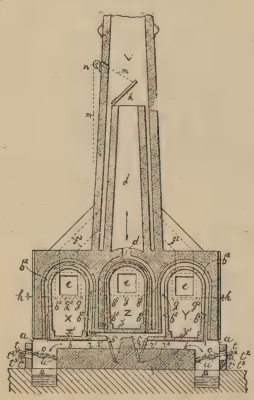
117. A car stopping device for tunnel kilns and driers. ANON. *Brit. Clayworker*, **32**, 110(1923).—It is frequently suggested that the opern. of a tunnel kiln or tunnel drier would be facilitated if the rail tracks were inclined downward toward the exit and instead of being laid level. In the latter case which is usual, a mechanical device is necessary to push the long train of cars along the track. This device can only be operated if the tunnel is full of cars and an additional car is ready at hand to be added to those already in place when the whole train is pushed forward. If the track is inclined the cars will travel by gravity to the exit end, the only requirement being a safety stop to prevent over-running when the whole train is in movement. A satisfactory stop for handling cars on an inclined track is described. H. G. S.



PATENTS

118. Kiln. ENOCH P. STEVENS. U. S. 1,465,744, Aug. 21. A kiln comprising a center flue for the admission of heated gases, a horizontal floor, means coöperating with said flue for deflecting gases downwardly toward said floor, apertures in said floor and a baffle wall placed below said floor for causing the heated gases to take a tortuous course in passing from said kiln.



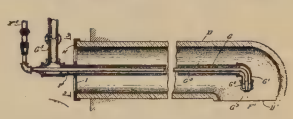


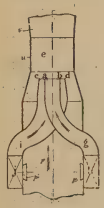
119. Car for tunnel kilns. STEPHEN A. MITCHELL. U. S. 1,465,737, Aug. 21. A car for transporting bricks and analogous ware through a tunnel kiln comprising a body portion and pier-like goods supports thereon extending transversely to the direction of car travel and spaced apart to provide channels open at their outer ends and upper edges, said supports having their upper edges sloping downwardly from the sides of the car toward its center.

120. Kiln for firing pottery and other ware. CHARLES FREDERICK BAILEY. U. S. 1,465,573, Aug. 21. In firing app. of the class described, three kilns arranged side by side, a chimney common to the three kilns, the center kiln being provided with a horizontal heating flue extending

under it and a heating flue extending around it and communicating with the said chimney at its outlet end and with the horizontal flue at its inlet end, and the outer kilns having heating flues extending around them and communicating at their outlet ends with the said horizontal heating flue, and fire-places arranged at the outer sides of the outer kilns and provided with flues extending under the outer kilns and communicating with the inlet ends of their said heating flues and with the said horizontal heating flue. Cf. *Ceram. Abs.*, **2** [4], 81(1923).

121. Tunnel-kiln oil burner. GERALD ELLIS IRONS. U. S. 1,465,011, Aug. 14. An oil burner comprising an oil supply pipe with a restricted discharge orifice at its combustion end, a steam jacket surrounding said pipe with an annular discharge orifice surrounding the first mentioned orifice, and a non-metallic refractory shell surrounding the steam jacket and forming an air jacket for the latter, said shell having an air inlet at its outer end and having an opening at its inner end through which the discharges from said orifices may pass.





122. Induced-draft device. LOUIS PRAT. U. S. 1,465,683, Aug. 21. In an induced draft device for chimneys or the like, a plurality of fans, each adapted to deliver a substantially constant volume of fluid into the chimney, and a permanently open discharge nozzle of predetermined size for each fan, disposed in the chimney, to cause the fluid discharged by the fan to carry along the chimney gases in ejector fashion.

Geology

123. Problems in geology of service to ceramics. WIEGAND BRAUN. *Ber. der Deut. Keram. Gesell.*, **4** [1], 36–42(1923).—Examples are given of ways in which geol. sci. can be helpful to ceram., especially in the systematic uncovering of deposits of raw materials used in ceram. and in the development of useful new raw materials. It is also recommended that the ceram. indus. help support geol. research of value to ceram. E. N. B.

124. Kaolin in Mexico. ANON. *Chem. Age*, **9** [218], 14(1923).—The Mexican Govt. has made arrangements for working the numerous and extensive kaolin deposits existing in the country, which constitute an immense source of wealth. Hitherto no attempt had been made to work these deposits, which contain an inexhaustible supply of mat. for manuf. of the finest porcelain. O. P. R. O.

125. On clay. TOSHI SUZUKI. *J. Jap. Cer. Assoc.*, **370,** 310–4(1923).—Clays are classified in 2 groups, *i. e.*, (1) residual clay and (2) transported clay. Residual clay has chiefly been produced by weathering of feldspathic rocks, although it has often been produced by the action of hot spring or sulphurous vapors. 1. *Residual clays due to the action of weathering.* Clays of Hanasaka and Gokokuji (used in Kutani-ware) as well as that of Izushi (used in Izushi-ware) are kaolins from liparite. Gairome clays produced in the provinces of Mikawa, Owari, Mino and Iga are kaolins from granite. Very plastic reddish brown clay used in Onko-ware is a residue of a calcareous rock whose calcium carbonate has been dissolved away by weathering. 2. *Residual clays due to the action of hot spring or sulphurous vapors.* Some of clays used in the manuf. of Satsuma-ware were produced from augite-andesite by the action of sulphurous vapors and hot spring. Izumiyama clay used in Arita ware is a residue of liparite which was decomposed by the action of sulphurous gases. Tobe clay used in Tobe-ware was produced by combined action of hot spring and weathering on mica-andesite. Clays produced in the manuf. of Aizu-ware as well as amalgatolite of Mitsuishi were produced by the action of hot spring on liparite. 3. *Transported clays.* Fukushu clay is a fire

clay of coal measure. Kibushi clays found in Mino, Owari, Ise and Iga, those used in Banko- and Tokoname stonewares, clay used in Shigaraki-ware, raw material of Awaji faience and many clays used in the manuf. of crude faience as well as architectural potteries are of tertiary origin. Diluvial and alluvial clays are used in the manuf. of Takatori- and Imbe stonewares and most of crude faience, roofing tiles, sewer pipes, common brick, etc. S. K.

126. Diatomaceous earth produced in the Islands of Oki. DENZO SATO. *J. Jap. Cer. Assoc.*, **369**, 264–66(1923).—Geol. of the islands is given in detail. There are 3 large deposits of diatom. earth in the islands. Analyses of typical products are:

Deposit	Insol. matter	Sol. SiO_2	Fe_2O_3	Al_2O_3	CaO	MgO	K_2O	Na_2O	Loss	Total
Iinoyama	43.93	37.51	1.17	3.06	0.00	0.19	0.57	0.28	13.06	99.77
Kamo	34.37	48.05	1.38	2.80	trace	.36	.32	.15	12.54	99.97
Minoura	34.25	46.32	0.75	3.60	0.00	.27	.63	.23	13.54	99.59

S. K.

127. Countries producing kaolins. ANON. *Chem. Age* (London), **9**, 11(1923).—*Great Britain.* True kaolins are found in two counties, Cornwall and Devon. The plastic "ball clays" are not to be confused with kaolin or china clay; these are employed in the manuf. of white wares, Dorsetshire. *France.* Deposits of kaolin occur in numerous districts of France. *Germany and Austria.* The kaolins of Ger. are of great industrial importance. *Saxony.* The earliest known occurrence of china clay in Europe was in Saxony. *Czechoslovakia* (*Bohemia*). Kaolin occurs associated with graphite; the principal area of exploitation lies between Mugrau and Schwarzbach. *Roumania.* Kaolinized formations occur in Roumania; these have not been worked. *Sweden.* The kaolins of Sweden are found in a comparatively limited area in the northern part of Scania (S. Sweden). *Denmark* (*Bornholm*). Kaolin is found at the foot of the granite plateau, north-east of Ronne. *Spain.* Kaolin-bearing rocks are fairly abundant in Spain, but nowhere are they exploited on a large scale. *Portugal.* In Portugal the name *tierra de vinos* is often given to kaolin. Kaolin-bearing sandstones are recorded in Portugal; also clean white kaolin which is employed for ceram. purposes and the clarification of wine. *Italy.* The kaolin industry of Italy is not well developed, active investigation might reveal many more deposits than at present known. *Russia.* Considerable deposits of kaolinic clays are found in S. Russia. *China.* The raw mat. of the porcelain industry of China possess a peculiar interest, as porcelain was here manufd. centuries before the first was made in Europe. *Japan.* The porcelain clays of Japan were discovered many centuries later than those of China. *India.* High grade kaolin rocks are scarce in India, but white clay is worked on a small scale for many purposes. *The Federated Malay States.* In the Federated Malay States, kaolin of a remarkable purity occurs abundantly. *Australia.* Kaolin mat. is not uncommon in Australia, but it does not appear to have serious commercial importance. *Canada.* China clay is worked in Canada 40 m. northwest of Montreal, Quebec. *United States.* The marketable kaolins of the U. S. are found in the Eastern States, fairly numerous and their value and importance is increasing. They show a great range of varieties, some high-grade clays, but few possessing the qualities peculiar to the best European kaolins. Several white clays are termed kaolins in the U. S., though they may not have the attributes of true kaolins, but may be ball clays, fire clays, or clays more suitable for stoneware. *Africa.* Kaolinized granitic rocks probably occur in many places in Africa, but none has been exploited for kaolin. In the Congo highly kaolinized granite and gneiss are found at the surface, and the kaolin washed therefrom has been employed by the natives as a whitewash. (From J. A. Howe's Handbook of Kaolins.) O. P. R. O.

128. Fluorspar mining in the western states. R. B. LADOO. U. S. Bur. Mines,

Repts. of Investigations, No. **2480,** 35 pp.(1923).—All the known fluorspar deposits of N. M., Ariz., Utah, Calif., Wash., Colo., and Nev. were examined. Descriptions of the individual mines, including their geology, mining and milling methods, flow sheets, and some analyses of the ore, are given. The deposits are so small, or so inaccessible, or the ore is so poor that profitable production of gravel grade of fluorspar, acceptable to eastern steel mills, is not likely to be possible. The production of acid fluorspar in these states, from known ore bodies, probably will not exceed 100 tons annually, that of ground fluorspar will not be more than 3000 tons. E. F. H. (*C. A.*)

PATENTS

129. Process for the manufacture of zinc white. Armand Nihoul and C. Clerc. U. S. 1,463,483, July 31. In the process of manufacturing zinc white, precipitating the zinc in the state of carbonate, re-dissolving said carbonate in an acid solution, and further precipitating the zinc in the state of sulphide by means of hydrogen sulphide gas.

130. Process for the manufacture of alkali-metal silicates. Camille Deguide. U. S. 1,463,037, July 24. The process of producing alkali-metal silicates, which consists in decomposing barium silicate by water and an alkali-metal salt the acid radical of which forms a barium salt less soluble than barium silicate.

131. Manufacture of sodium fluoride. Henry Howard. U. S. 1,464,990, Aug. 14. Process of making sodium fluoride which comprises simultaneously adding hydrofluoric acid and ammonia to a solution of sodium chloride. See following abs. Also *Ceram. Abs.*, **2** [8], 189(1923).

132. Process of making sodium fluoride. Henry Howard. U. S. 1,464,991, Aug. 14. Process of making metal fluoride which comprises simultaneously adding hydrofluoric acid and ammonia to a solution of a salt of a metal which is more soluble than the fluoride of said metal at a relative rate sufficient to maintain the reaction mixture substantially neutral.

Chemistry and Physics

133. Determination of sulphate-, chloride-, and carbonate radicals contained in soda-lime glasses. Masao Igawa. *J. Jap. Cer. Assoc.*, **367,** 131–8(1923).—The author proposes the use of acid ammonium fluoride as decompn. reagent in the detn. of sulphuric anhydride, chlorine and carbonic anhydride contd. in glasses. 1. *Prepn. of ammonium fluoride, NH_4HF_2, for the detn. of sulphuric anhydride.* Silicon fluoride obtained by the action of sulphuric acid on ground quartz and ammonium fluoride is introduced into water. After filtering, the soln. is treated with an excess of ammonia, filtered through muslin and evapd. to dryness. Ammonium fluoride, thus obtained, is refined once more by sublimation. 2. *Prepn. of ammonium fluoride for the detn. of chloride.* Ammonium fluoride is purified by treating its soln. with silver nitrate. Then it is sublimed. 3. *Prepn. of ammonium fluoride for the detn. of carbon dioxide.* Ammonium fluoride is dissolved in water and treated with ammonia. The soln. is evapd. after filtration. 4. *Detn. of SO_3.* 3 g. of glass are mixed with about 9 g. of ammonium fluoride, and 5–6 cc. of water are added. The mixt. is evapd. to dryness, treated with sodium-carbonate soln: and filtered. The filtrate is once more evapd. to dryness. It is then extracted with 50% alcohol. The extract is evapd. to dryness, acidifying the soln. with oxalic acid. Sulphuric anhydride in the residue is detd. with barium chloride, after dissolving it with dil. HCl. 5. *Detn. of sulphur.* Total sulphur is detd. just as described above, but the sample must be decomposed in the presence of bromine. 6. *Detn. of Cl.* 5 g. of finely ground sample are mixed with about 15 g. of ammonium fluoride in a platinum basin. The glass is decomposed by adding 30 cc. of water to the basin and heating it at 60–70°C. Chlorine is detd. gravimetrically with silver nitrate, after removing silicic

acid with ammonia. 7. *Detn. of CO_2.* 15–20 g. of coarsely ground glass are put in a lead flask and decomposed by 25–30% soln. of ammonium fluoride. Carbonic acid gas liberated from the glass is absorbed by soda-lime, the app. and procedure being just like those of detg. carbonic acid gas in common carbonates by Fresenius-Classen's method. 8. *Examples of analyses.* Analyses of Belgian and American window glasses are:

No.	Na_2SO_4 (%)	Sulphur in forms other than sulphates, expressed as Na_2SO_4(%)	NaCl(%)	Na_2CO_3(%)
1	0.667	0.046	0.095	0.048
2	.908	.108	.071	.040
3	.068	.027	.154	.055
4	.960	.055	.151	.021
5	1.045	.000	.066	.051

S. K.

134. Fine and research chemicals. C. J. West. Nat. Research Council, *Reprint and Circular Series*, No. **44**, 45 pp.(1923); cf. *C. A.*, **16**, 195, 2633.—This is the second revision. It contains lists of American manufacturers, and of research chemicals, of biol. stains and indicators, of vital stains and of H-ion indicators that can be purchased in this country. E. H. (*C. A.*)

135. Silica studies. I. Loss of water of kaolin and its behavior in solid condition toward carbonates and oxides of alkaline earths. G. Tammann and W. Pape. *Z. anorg. allgem. Chem.*, **127**, 43–68(1923).—These expts. were undertaken on account of the very conflicting nature of the conclusions of other investigators. Data and curves are presented which were obtained in expts. on slimed and carefully washed Oschatz earth dried at 150°. These include dehydration, rehydration of material heated to 600°, behavior of $BaCO_3$ toward Al_2O_3 and kaolin, behavior of $CaCO_3$, $SrCO_3$, BaO, CaO and SrO toward Al_2O_3, SiO_2 and kaolin. Upon losing water at 550° kaolin decomposes into Al_2O_3, SiO_2 and water and at 930° the Al_2O_3, released at 550°, changes into another form less sol. in acids. These conclusions are based on the following evidence: (1) After loss of water at 550° the Al_2O_3 of kaolin is sol. in acids. (2) Heating to 800–900° renders both pure Al_2O_3 and that of kaolin difficultly sol. in acids. (3) Pure Al_2O_3 evolves notable amts. of heat between 850° and 1060°; kaolin at 930° evolves an amt. of heat which is proportional to its content in Al_2O_3. (4) After this evolution of heat the Al_2O_3 becomes denser and the kaolin shows a distinct increase of density. (5) Both Al_2O_3 and kaolin lower the dissociation temp. of alk. earth carbonates at 1 atm. about 220°. (6) Upon heating a mixt. of Al_2O_3 and SiO_2 heat evolution takes place at 940° as on heating kaolin and in both cases the Al_2O_3 becomes difficultly sol., but this same change of soly. is produced by heating Al_2O_3 alone. A. R. M. (*C. A.*)

136. Studies on clays. I. The acidic reaction of Japanese acid clays. Tsuruji Okazawa. *Bull. Inst. Phys. Chem. Research* (Japan), **2**, 189–221(1923).—K. Kobayashi has attributed the acidity of Japanese acid clay to its adsorptive action. O. has proposed a different explanation. Clays have many varied appearances and properties, but may be classified into 3 kinds from their reactivity to salt solns. and acids. When treated with salt solns. or strong acids, the first shows little or no soly., the second none for salt solns. but high with acids, and the third shows high soly. with both. Japanese acid clay belongs to the last class, but is not very different in compn. from common clays. When treated with salt solns., the positive radical in the neutral salt is drawn into the clay particle and Al in the latter is dissolved as a corresponding salt; *e. g.*, when $MgCl_2$ is used as the neutral salt, the reaction may be as follows: $R:Al.OH + MgCl_2 = R:Mg + AlCl_2OH$ and $AlCl_2OH + 2H_2O = Al(OH)_3 + 2HCl$, where R is the main radical in the clay; HCl thus produced gives the acidic reaction. This reaction is, therefore, considered to be attributed partly to adsorption and mainly to

double decompn. and the acidity is governed by the salt used, adsorptive and reactive affinities of the clay, stability of the reaction product and reaction velocity, etc. The value of the acidity is not definitely detd. by titrating with alkali. The so-called acidity of the acid clay is decreased greatly by burning at 700–800° for 1 hr. By heating, the state of mol. combination will be changed and Al_2O_3 in the clay will not be dissolved by salt solns. The relation between the burning and the quantity of Al_2O_3 dissolved from the clay by acid is opposite to the above relation. The higher the temp. of burning, the more Al_2O_3 is dissolved, the max. being at about 700–800°; the quantity dissolved is larger than that of other clay. At above 900° the quantity decreases quickly.

K. K. (*C. A.*)

137. The influence of fluxes on the transformations of quartz. N. PARRAVANO AND C. ROSSELLI DEL TURCO. *Gazz. chim. ital.*, **53**, 249–57(1923).—In previous work P. (*Ann. chim. appl.*, **10**, 150(1918)) clarified the nature of the transformations that take place in the burning of SiO_2 refractories, which consists substantially in converting quartzite into varieties having a greater vol., *i. e.*, tridymite, and cristobalite. This transformation occurs with or without the aid of the flux formed from the natural impurities present in the quartzite and of the lime used. After reviewing the existing information P. and T. describe their own expts. in which a quartzite (SiO_2 96.5, Al_2O_3 2.06, CaO 0.80%, Fe_2O_3 trace) was used to which 0.5, 1.0 and 1.5% oxides were added (Fe_2O_3, P_2O_5, B_2O_3, CaO and WoO_3). The brick were heated first 12 days at cone 15 (1430°) and then again for 15 days at cone 18 (1490°). The d. was detd. on the finely ground product. Microscopic examn. as well as the d. detns. showed under the conditions used, of which the absence of alkali was the most interesting, that B_2O_3 has the greatest accelerative action on the transformations of quartz even when only 0.5% is present. Its catalytic activity is so energetic that in practice it ought to be suitably weakened in order to be used advantageously. Fe_2O_3 has a notable catalytic action, perhaps through the formation of silico-ferrites as well as silico-aluminates (from the Al_2O_3 always present) giving mixts. fusible at temps. not too high. In this case the d. does not reveal the phenomena as well as the microscopic observations. E. J. W. (*C. A.*)

138. Adsorbent properties of clay. M. A. RAKUSIN. *Chem.-Ztg.*, **47**, 115(1923).—Ordinary clay, especially when ignited, possesses adsorbent properties similar to those of kaolin. A 1% soln. of petroleum in petroleum spirit, colored a deep reddish brown, was completely decolorized by standing for 24 hrs. in contact with 5% of ignited clay or 8% of air-dried clay. Suspensions of indigo in aromatic hydrocarbons were colored yellow after this treatment, while suspensions of indigo in petroleum spirit, kerosene, and vaseline oil were colorless. Aromatic hydrocarbons extd. from air-dried clay a yellow oil, insol. in petroleum hydrocarbons. This oil is probably derived from straw and manure kneaded into the clay during its prepn. J. S. C. I.

139. Synthetic aluminium silicate and its relations to kaolin. ROBERT SCHWARZ AND ALBERT BRENNER. *Ber.*, **56B**, 1433–7(1923).—When dil. neutral aq. solns. of $AlCl_3$, and Na_2SiO_3 are mixed in the ratios varying from 1:0.75 to 1:5 the proportion of SiO_2 in the ppt. increases until the compn. $Al_2O_3.2SiO_2 + 2H_2O$ is obtained after drying at 110°. This ppt. differs from kaolin in that it is comparatively easily decomposed by concd. HCl and loses H_2O at a lower temp. X-ray spectrographs show that 2-day-old and 8-day-old samples were amorphous but that after 8 days a cryst. structure, similar to that of kaolin had developed. D. MACR. (*C. A.*)

140. Influence of surface tension on melting and freezing. ERNST RIE. *Z. physik. Chem.*, **104**, 354–62(1923).—A mathematical paper. The influence of surface tension on the m. p. is investigated thermodynamically, and formulas are deduced for the change in the m. p. A new theory of the structure of glasses is given, and the difference between this and that of Tamann is discussed. H. J. C. (*C. A.*)

141. New diagrams for the valuation of fuel gas and flue gas analysis. WILHELM SCHULTES. *Die Wärme*, **45**, 213–8; *Chem. Zentr*, **1922**, IV, 684.—The diagrams of Ostwald, Seufert and Krämer are complicated in form, are too exact for technical work and do not permit direct graphical readings of the heat losses. By simplifying the formula upon which they are based, a similar representation of the combustion triangle is derived, with diagrams which allow a direct valuation of analysis. C. C. D. (*C. A.*)

142. The three-component system: lime, silica and alumina. R. GRÜN AND K. BIEHL. *Zement*, **12**, 10–1, 18–9, 26–7, 34–5, 44–5, 111–3, 120–1, 126–7(1923).—A phase-rule diagram and a space diagram of the system CaO, SiO_2, and Al_2O_3 are given. $3CaO.SiO_2$, $2CaO.SiO_2$, $3CaO.2SiO_2$, and $CaO.SiO_2$ are the compds. formed by CaO and SiO_2. $3CaO.Al_2O_3$, $5CaO.3Al_2O_3$, $CaO.Al_2O_3$, and $3CaO.5Al_2O_3$ are formed by CaO and Al_2O_3. $Al_2O_3.SiO_2$ is formed by Al_2O_3 and SiO_2. $2CaO.Al_2O_3.SiO_2$ and $CaO.Al_2O_3.2SiO_2$ are formed by the 3 substances. Photomicrographs have been made of various mixts. of the system which show that all of the above compds. have definite cryst. structures. The phys. properties of all the compds. are given. R. F. S. (*C. A.*)

143. Graphic method for computing heat balance. F. A. SHORKEY. *Blast Furnace & Steel Plant*, **11**, 348–54(1923).—A series of graphs is given to replace the use of formulas for boiler-room computations. The charts are based on no CO present and a max. of 19% CO_2, and include (1) detn. of H (2) detn. of volatile C (3) losses due to H_2O (4) losses due to burning of H (5) losses due to combustible in ash and S correction (6) losses due to heat in dry flue gases and (7) losses due to CO in dry flue gases.
C. C. D. (*C. A.*)

144. Estimation of iron in ores and silicate rocks. F. R. ENNOS AND R. SUTCLIFFE. *Summary of Progress Geol. Survey*, **1921**, 174–6.—In the case of samples contg. Fe, Al, Ti and phosphate, fuse the weighed oxides of the Al group with pyrosulfate and est. the Ti colorimetrically in the soln. resulting from the fusion. Then evap. the soln. to a vol. of about 100 cc., destroy the excess of H_2O_2 by treating the hot soln. with the required quantity of H_2SO_3, and sat. the soln. at 90° with H_2S. Sep. the ppt. of S and Pt sulfide (the Pt is derived from the crucible in which the fusion was made) by filtration and wash with very dil. H_2SO_4. Cool the filtrate, oxidize with dil. $KMnO_4$ soln., add 10 cc. of concd. HCl and 5 cc. of 20% NH_4CNS soln., and titrate the Fe with standardized $TiCl_3$ soln. J. C. S. (*C. A.*)

145. Surface tension and adsorption phenomena in flotation. A. F. TAGGART AND A. M. GAUDIN. *Trans. Am. Inst. Min. Met. Eng.*, **68**, 479–535(1923).—Surface tension measurements are described. Frothing is caused by the sol. constituents of the agent. A change of surface tension of the solvent by the solute produces the frothing. When ore is added the viscosity of the mixture is increased and the froth becomes more permanent. The surface tension is not affected in any way by an insol. oil, such as Nujol. The behavior of various flotation oils at the water surface is studied. The adsorption properties at liquid and solid surfaces were studied by using the froth formed and the rejected soln. W. A. M. (*C. A.*)

146. New data on thermochemistry. WOJCIECH SWIENTOSLAWSKI. *Bull. soc. chim.*, **29**, 496–9(1921).—Combining his own results (*C. A.*, **5**, 1414, 1415; *Bull. Acad. Sci. Cracow*, **1909**, 941–72) with those of Fajans (*C. A.*, **14**, 1623), S. deduces values for the heat of formation of any linking such as $(C-X)$ or $(H-X)$ and shows that it may be considered as made up of two parts, one part being produced by the atom $(C-)$ or $(H-)$ and the other by the atom to which it is linked. Values are calcd. for C and the halogen atoms. It is shown that the heat produced by the atom in the formation of a compd. $X-Y$ is not always equal to the heat produced by it in the formation of the simple mol. $X-X$. J. C. S. (*C. A.*)

General

147. Utilization of a waste alumina. IWAZO TAKITA AND MASAJIRO WATAYA. *J. Jap. Cer. Assoc.*, **366,** 98–108(1923).—The research relates to the utilization of impure alumina which is obtained as a waste product in the process of extracting alum from calcined alunite. The waste alumina of the Asada Alum Works, Shikama, Harima, has been used in the expts. 1. *Properties of the waste alumina.* Analysis of the waste alumina is: SiO_2 28.50, Al_2O_3 65.33, Fe_2O_3 0.56, CaO 1.25, K_2O 1.80 and SO_3 2.46%. Refractoriness is over cone 37. 2. *Manuf. of chem. porcelain.* Expts. on the manuf. of chem. porcelain with 7 different bodies and 7 glazes are described. The best result for cone 16 was obtained with No. 1 body and *e* glaze. No. 1 body was composed of 23.2 waste alumina, 33.7 gairome-clay of Tokiguchi, 25.0 ohmishima quartz and 18.1% ohmishima feldspar. Its formula is $0.1036K_2O$, Al_2O_3, $3.1303SiO_2$. Small crucibles were formed by casting a slip composed of 100 raw materials, 0.25 sodium carbonate, 0.08 water-glass and 90 water. The glaze which was applied on their biscuits is $\left.\begin{matrix}0.1K_2O\\0.9MgO\end{matrix}\right\}1.0Al_2O_3, 10.0SiO_2$ in which MgO was added in form of calcined magnesite. The glazed biscuits were fired at cone 16. The products stood various tests better than German crucibles. 3. *Manuf. of glass pot.* Small pots made of 18 different bodies by casting and fired at cones 010a, 8 and 15 were filled with a glass mixt. composed of 38.22 cryst. borax, 12.40 boric acid, 92.04 barium oxide and 36.00 sand; they were heated at cone 8 to compare their resistance to corrosion. Detailed descriptions are given on the procedure and results of the expts. 4. *Manuf. of refractory brick.* Superior brick were obtained by the following process: The waste alumina is ground, pressed into briquettes, fired at cone 18 and reground; brick made of 80% grog and 20% raw Kibushi-clay are fired at cone 16. Their shrinkage was 0.44% in drying and 0.33% in firing. Their refractoriness was over cone 37. S. K.

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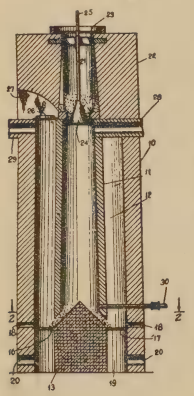
Abrasives

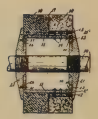
PATENTS

1. Aluminous abrasive and method of making the same. HAROLD A. RICHMOND and ROBERT MACDONALD, JR. U. S. 1,467,590, Sept. 11. In the manuf. of artificial corundum the improvement which consists in regulating the percentage of titanic anhydride in it to control the resist. to fracture and to adapt it to various grinding and polishing operations while providing appreciable quantities of both silica and iron oxide in the product.

2. Method of making abrasive articles of manufacture and product. FRANK JOSEPH CRUPI. U. S. 1,468,960, Sept. 25. The herein described method of making abrasive manufactures consisting in coating a backing with a solution of glue; in applying abrasive material to the glue coating; in coating the glue and abrasive coating with a colloidal, waterproof, adhesive composition containing rosin, glue, phenol, acetic acid and water in about the proportions stated, and in which the acids prevent coagulation of the glue.



3. Apparatus for the manufacture of aluminum chloride. FRANK W. HALL. U. S. 1,468,632, Oct. 2. App. for the manuf. of aluminum chloride comprising a retort, a combustion chamber about the retort adapted to supply heat thereto, a discharge outlet from the retort to the combustion chamber and means for maintaining ash from the retort about said outlet so as to form a gas-tight seal.



4. Segmental abrasive wheel. WALLACE W. GREENWOOD. U. S. 1,469,723, Oct. 2. A grinding wheel comprising a cylindrical drum adapted to be mounted concentrically on the wheel spindle, abrasive segments mounted thereon and forming a cylindrical grinding surface, each of said segments having a projecting lug on an inner portion, and clamping means including a removable wedge to engage said lug with adjustable press. and replaceably fasten the segment to said drum.

Art

5. Greek terra cottas. M. E. P. *Bull. Met. Mus. Art*, **18** [9], 212(1923).—Seven examples of Greek koroplastic art lately acquired for the Museum are described. Illus. ED.

6. The trend in modern American ceramics. ERNESTINE EVANS. *Shadowland*, **7** [2], 58(1923).—A few of the eminent painters are turning to the potter's craft in their search for a new medium, thus overcoming the danger of the *commonplace* in American pottery. ED.

PATENT

7. Manufacture of ornamented ware. JOHN B. LESSELL. U. S. 1,467,111, Sept. 4. The method of treating the surfaces of glass, pottery, porcelain, metal, and like articles, which consists in applying to the article, a mat. of selected outline which will not fuse, applying thereon and over the said mat. a fluid containing the desired coloring matter, firing the article to fuse the coloring matter, and then removing the said mat. and coloring matter thereon from the article.

Cement, Lime and Plaster

8. Italian cement plants. R. M. *Rev. Mat. Constr. Trav. Pub.*, **166**, 160–2(1923).—Detailed list of the important 48 concerns, controlling about 70 plants, that manuf.

natural cement and Port. cement, giving their individual annual production, their main products, and the numbers and types of fur. in use. The total production amts. to 1,700,000 short T. annually. Their mechanical equipment is mainly of Ger. origin L. N.

9. Franco-Belgian association for testing materials. Session of June 23, 1923. H. C. *Rev. Mat. Constr. Trav. Pub.*, **166**, 165–7(1923).—*Influence of low temperature on the hardening of mortars, after setting.* (Mr. Baire.) Specimen of 5 cm. cubes, made of cements and mortars were inclosed, after setting, in soldered zinc containers. One set of containers were put in an ice-making calcium chloride bath, having an av. temp. of —6° to —8° C. The other set was kept at an av. temp. of +14°. At various time intervals containers were opened and the specimens tested. The following are results for a mortar of an aluminous cement:—

	Days				
	1	2	3	7	28
Tensile Strength					
Temp. Normal	17.5	20.5	19.7	25.2	28.2
Temp. below freezing	17.5	17.5	18	20.2	20.5
Compressive Strength					
Temp. Normal	165	215	275	340	385
Temp. below freezing	165	195	212.5	260	255

It is concluded that low temp. affects the hardening of hydraulic binders, due to the effect of temp. on chem. reactions, and that the variation in resistance between specimens held at different temps. depends upon the binder, the fused cement being relatively less influenced by low temps. than slag cement. L. N.

10. Concrete-lined pipes. Anon. *Indus. Australian & Mining Standard*, **70**, 280(1923).—A process has been devised by a Brit. firm for applying a lining of concrete to cast iron pipes, thereby eliminating the formation of deposits even from bad water. This is accomplished by a new mach. in which the pipe to be lined is rotated at high speed so that the concrete is driven into place by centrifugal force. A lining from $^1/_2$″ to 1″ in thickness is obtained according to requirements, and pipes of all diam. from 4″ to 72″ have been lined successfully. O. P. R. O.

11. Quick-setting cement. Anon. *Can. Eng.*, **45**, 362(1923).—Tests have been made with *ciment fondu* at the Conservatoire Nationale des Arts et Metiers with a view to fixing safe working stresses for this mat. when used for reinforced concrete. Up to the present the same amt. has been used, as if Port. cement were used, but these expts. show that not nearly as much is required. The mixt. used in the expts. consisted of 800 l. of gravel, and 400 l. of sand, mixed with 300 kg. of Port. cement, and with either 300 kg. or 200 kg. of *ciment fondu*. Cubes made with the Port. cement tested at 3 mos., broke under a load of 155 kg. per sq. cm., while at 6 mos. the strength had risen to $163^1/_2$ kg. per sq. cm. Corresponding cubes of concrete had at 3 days a strength of 324 kg. per sq. cm., which in 3 mos. had risen to $362^1/_4$ kg. per sq. cm. Hence at 3 days the strength was equal to that of the Port. cement concrete at 3 mos. With the weaker mixt., contg. 200 kg. of *ciment fondu*, the strength at 3 days was 242 kg. per sq. cm.; at 3 mos., 252 kg. per sq. cm., and at 6 mos., 257 kg. per sq. cm. O. P. R. O.

PATENTS

12. Manufacture of artificial stones. Anon. Ger. Pat. 144,706. According to this invention light and highly porous bodies produced from blast fur. slags and similar scoriae, with the addn. of lime or cement to act as a binding agent, are hardened by the action of either low or high press. steam immediately after molding and setting according to the preliminary setting thereof. (*Quarry & Surv. & Contractors' Jour.*) O. P. R. O.

13. Hardened water-repellent gypsum plaster and method for producing the same. Joseph W. Emerson. U. S. 1,470,260, Sept. 25. An article of manufacture comprising "set" or hydrous gypsum plaster, the pores of which are substantially filled with sulphur.

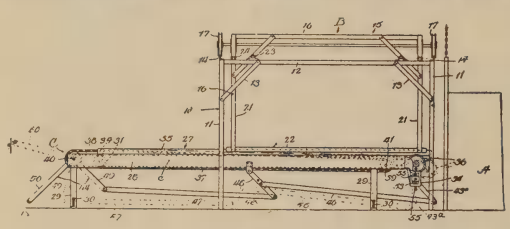
14. Electrical cement. Alan P. Sullivan. U. S. 1,468,930, Sept. 25. An elec. cement comprising more than 80% of copper powder together with magnesium chloride and magnesium oxide.

Enamel

PATENTS

15. Process for removing enamel from old and new enameled articles. H. Adler. Ger. pat. 374,114, Jan. 17, 1922. Iron shot, quartz, sand, or the like, is forced through steel tubes by compressed air on to the surface of enameled articles contd. in a closed chamber. (*Jour. Soc. Chem. Ind.*) O. P. R. O.

16. Removal of scale and rust from iron and steel. Harry N. Holmes. U. S. 1,470,225, Sept. 25. The method of removing rust or scale from iron or steel, consisting in pickling the same in an acid bath containing at least one-fifth of 1% by volume of an aldehyde to inhibit the attack of the acid upon the base metal.



17. Charging apparatus for enameling furnaces. William Hogenson. U. S. 1,468,944, Sept. 25. Charging app. for enameling fur., comprising in combination, a carriage having a removable work carrier, a furnace charging fork, arranged to receive said work carrier when the latter is moved over said charging fork, tracks, for supporting one end of the fork, and depressible rollers for supporting the other end of the fork.

18. Enameling. K. Warga. Brit. 191,771, Aug. 16, 1921. Multicolor decorations, designs, lettering, etc., are printed on surfaces of Al or Al alloy and enameled. Films comprising mixts. of mineral colors or pigments and vitreous flux with a liquid or viscous vehicle are printed successively on the metal surface, the melting points of the mixts. being so arranged that the mixt. adjacent the metal surface has the lowest m. p. and the m. p.'s of the successive films rise progressively. The metal surface is oxidized prior to printing and the films are fixed by firing in a kiln in which a temp. corresponding to the highest m. p. is maintained. (*C. A.*)

Glass

19. On the relation between the composition and chemical resistance and chemical attack of glass. G. Keppeler. *Zeits. f. ang. Chem.*, **51**, June 27, 1923.—The surface deposit is mostly a thin layer of soda crystals. Soda is dissolved out of the glass by water and combining with CO_2 from the air forms Na_2CO_3. Several microscopic tests verify this assumption. The devitrification of old glass is not due to a change in structure arising from crystallizing forces, but to hydrolysis. In the case of complex glasses he hopes to det. the laws governing soly. which may be attributed to individual oxides. By introducing equi-molecular portions of CaO, SrO, and BaO he found for certain percentages a practically insol. glass was attainable by the use of CaO, while the introduction of SrO and BaO did not attain practical insoly. Further expts. in substituting boric acid for silica were only briefly mentioned. W. M. C.

20. Production of glass wool. Anon. *Le Verre*, **3** [7], 1923; *Keram. Rund.*,

31, 338(1923).—The production of glass wool by means of a machine made by the Duplex Machine Co., Marktrewitz, is described. H. G. S.

21. The why and wherefore of seedy glass during melting. A. J. RITTMAN. *Glass Worker,* **42** [42], 19(1923).—Seeds are suspended gas in the glass and come from the raw mat. Increased ht. or change of batch to lower melting temp. will correct this fault. R. J. M.

22. New glass furnace types in England and Europe. H. W. HESS. *Glass Worker,* **42** [44], 11(1923).—Twelve pot recuperator fur. are being used with success. Greater economy is claimed. R. J. M.

23. Specifications in the British glass industry. W. E. S. TURNER. *Glass Worker,* **42** [45], 11(1923).—From *The Pottery Gaz. and Glass Trade Review.* The need of standard specif. for glass food containers is urged. R. J. M.

24. Treatise on the design of pot arches. T. THEISEN. *Glass Worker,* **42** [47], 11(1923).—Paper before the Brit. Soc. of Glass Tech. Improved types of pot arches to obtain more even heat and higher temp. are discussed. R. J. M.

25. Resistant glass. *Le Verre,* **3,** 183(1923). French pat. 548,253. **Procedure for making a resistant glass.** W. HORAK. March 6, 1922. (Czecho-Slovakia, Feb. 4, 1922).—The chem. compn. in per cent is sand 60–70, boric acid 15–30, potassium carbonate 1–2, sodium carbonate 3–6, kaolin 2–6, mica 0–4, zirconium oxide 1–3, titanic acid (oxide) 1–3, having the following approx. mol. compn. $70SiO_2.20B_2O_3.3RO.-{}^1/_2Al_2O_3.ZrO_2$ (where R = NaK). The glass has a small coeff. of expansion and withstands sudden heating and cooling. (Manufactures of this glass have been given the trade name of "Resista" in Europe.—Abstr.) L. N.

26. The analysis of glasses rich in boric oxide. V. DIMBLEBY AND W. E. S. TURNER. *Jour. Soc. Glass Tech.,* **7** [25], 76(1923).—A method of analysis of sodium boro-silicates of high boric oxide content is described which eliminates errors due to volatilization. J. G. P.

27. The influence of boric oxide on the annealing temperature of boro-silicate glasses. S. ENGLISH AND W. E. S. TURNER. *Jour. Soc. Glass Tech.,* **7** [25], 73(1923).—It is well known that the boro-silicate glasses of which present day chem. glassware is made need a comparatively high temp. for their annealing. Observations point toward boric oxide as the probable cause of the high annealing temp. of commercial boro-silicates. Expts. were conducted on 2 series of sodium boro-silicates, 1 series with 20% Na_2O and variable B_2O_3, the other with 10% Na_2O and variable B_2O_3. The annealing temp. were detd. on samples of rod with plane polished ends as used in previous investigations. The results clearly indicate in the case of the glasses with approx. 20% of Na_2O that as silica is substituted by boric oxide, the annealing temp. rises, reaches a max. at about 16 or 17% of the oxide and then steadily falls. In the case of the glasses with 10% sodium oxide, the values for the glasses examd. fall continuously. J. G. P.

28. A study of the melting and working properties of boric oxide glasses with special reference to the boro-silicates. V. DIMBLEBY, F. W. HODKIN, M. PARKIN, AND W. E. S. TURNER. *Jour. Soc. Glass Tech.,* **7** [25], 57(1923).—Meltings were carried out on 3 series of sodium boro-silicate glasses contg. approx. 20, 10 and 5% sodium oxide. In each series the amt. of sodium oxide was maintained approx. constant while the silica and boric oxide portions were varied. In the first series 9 glasses were prepd. contg. from 0 to 45% boric oxide; in the second series 8 different meltings were made and the amt. of boric oxide ranged from 15 to 50%; in the 3rd series involving 7 meltings the range of boric oxide tested was from 20 to 45%. It was found throughout the range that homogeneous glasses could be prepd. and there was no segregation in layers of different compn. Boric oxide beyond a certain amt. does not make for dura-

bility but the reverse. With increasing boric oxide in each series and diminution in the amt. of silica, the rate at which melting and refining occurred increased rapidly. Soda ash has considerably greater fluxing action than has borax or boric oxide. The rate of change of viscosity increases very greatly as silica is substituted by boric oxide. There was considerable loss of boric oxide through volatilization. All glasses of the 20 and 10% series examd. could be worked readily in a blow pipe and showed no signs of devitrification. J. G. P.

29. The effect of various constituents on the viscosity of glass near its annealing temperature. S. ENGLISH. *Jour. Soc. of Glass Tech.*, **7** [25], 25(1923).—Measurements of the mobility of soda-lime, soda-magnesia and soda-alumina glasses, 1 soda-lead oxide glass and 1 potash-lead oxide glass show that in spite of their variability in working properties, the rate of change of viscosity near their annealing points is almost constant. The mobilities were obtained by measg. the rate at which rods were stretched under the action of a wt. at certain fixed temps. A description of the method and app. is given. The rise of temp. necessary to reduce the viscosity by $^1/_2$ in this range being 8° for 2 glasses, 9° for 10 glasses, 10° for 3 glasses, 11° for 2 glasses and 12° for 1 glass. Twyman's equation is shown to be nearly correct for the range of temp. near the annealing point, especially for the softer glasses. The results indicate that the mobility is approx., but generally not accurately, a logarithmic function of the temp. and that at higher temps. than those used in this investigation the mobility temp. curve for most if not all glasses will have a point of inflection which will to a certain extent det. the sweetness or otherwise of the glasses in their working ranges. Sweetness depends on 2 factors (1) the rate of change of viscosity with temp. and (2) the rate at which ht. is lost by the glass at its working temp. J. G. P.

30. An examination of some current views on the detection of strain in glass. S. ENGLISH. *Jour. Soc. Glass Tech.*, **7** [25], 20(1923).—Strain is not detected in glass by polarized light if the direction in which the stress is acting is parallel to, or at right angles to the plane of polarization of the light incident on the glass. For the best results the glass should be held so that the direction of the stress is at 45° to the plane of polarization of the light. Objections to several marketed strain viewers are made. Strain viewers should be designed so that no light can pass directly from the source to the analyzing nicol and no light from the source can strike the object being tested and be reflected to the eyepiece, otherwise untrustworthy indications are liable to be obtained. J. G. P.

31. Analysis of bubbles in glass. RESEARCH STAFF OF GEN. ELEC. CO., LONDON (J. W. RYDE AND R. HUDDART). *Proc. Phys. Soc. London*, **35**, 197–8(1923).—In order to distinguish bubbles generated by chem. action in glass from those introduced by mech. processes, spectroscopic tests are made for the presence of N. To liberate the gas from the bubbles, a specimen of the glass is placed in one limb of a quartz U-tube and Hg in the other, and the glass is heated and then disintegrated by sudden cooling, the tube being plunged into cold H_2O at the same time that the Hg is thrown on to the glass. C. C. V. V. (*C. A.*)

32. Some aspects of the autoclave test for durability of glass. W. L. BAILLIE. *J. Soc. Glass Tech.*, **6**, 279–88(1922); cf. *C. A.*, **16**, 2204.—Durability depends not only on the corroding agent employed, but on the method of manuf. and the purpose for which the ware is designed. The use of accelerated tests possibly introduces disturbing factors. The use of glass powder is not recommended, as the surface exposed cannot be estd., there being no simple relation between sieve grading and grain vol. Further, cementation between grains probably occurs when the decompn. becomes extensive and this prevents both free access of the corroding agent to the whole surface and the removal of all the alkali in the final washing stage. The autoclave test executed on finished pieces

of suitable size, or on test blocks cut from finished ware and having the cut surfaces weathered for some time before use, is flexible and capable of producing results in close agreement. Steam is recommended in preference to water as a corroding agent, and times and pressures are conveniently varied to suit the type of glass under test. Thus a series of glasses may be sharply differentiated at 4 atm. pressure, while at 10 atm. all may be equally bad, in which case 4 atm. will be a suitable pressure for the test. Rise of temp. does not accelerate the action of steam on all glasses to the same extent, which may be due to the fact that decompn. is the result of two reactions differently accelerated by temp. rise. The effect of increasing the pressure is not so easily accounted for. It is suggested that high pressures may promote reactions which do not occur at pressures nearer atm. *E. g.*, Turner (*C. A.*, **16**, 4026) found that with glass rich in alkali the alky. at 5 atm. was greater than that at 25 atm. J. S. C. I.

33. Use of the autoclave test as a method of testing glassware. W. H. WITHEY. *J. Soc. Glass Tech.*, **6**, 289–91(1922).—While of very great use for glasses designed for contact with steam or water under pressure, the autoclave test in general is much too severe for ordinary ware. Two glasses alike in their resistance to attack at a low temp. may differ at a higher temp. and the order of their difference may be inverted at a still higher temp.; under the appropriate conditions suited to their characteristics both may be equally good. Tests described on a Zn boro-silicate and a lime boro-silicate glass showed that under prolonged treatment the former flaked, continually exposing a fresh surface to the corroding agent, while the latter acquired a "bloom" through which the corroding agent had to penetrate to reach the glass surface. J. S. C. I.

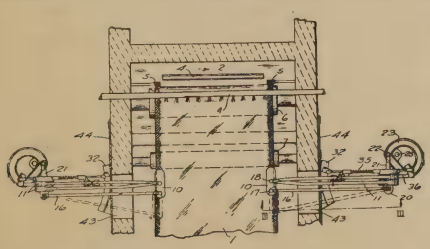
34. Lubrication of glass-making machinery. ANON. *Glass Ind.*, **4**, 130–1(1923). *C. A.*

PATENTS

35. Apparatus for making wire glass. NOAH A. LISTON. U. S. 1,466,025, Aug. 28. An app. for making wire glass, which includes a roll formed of series of annuli or rings mounted on a core, the said rings having serrations, the serrations on one ring being out of horizontal alignment with the serrations on the adjacent ring.

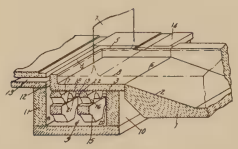
36. Reinforced glass. VICTOR C. EDWARDS. U. S. 1,467,030, Sept. 4. As a new article of manuf., a reinforced glass structure comprising the combination of a transparent sheet of a pyroxylin compn. with a transparent sheet of glass capable of absorbing those actinic rays of light which tend to induce an appreciable color change in said pyroxylin compn.

37. Method and apparatus for drawing and flattening sheet glass. JAMES WHITTEMORE. U. S. 1,466,460, Aug. 28. In an app. for drawing and flattening sheet glass, a receptacle containing a mass of molten glass from which the sheet is drawn upwardly, means for bending the drawn sheet into a horizontal plane, means for reheating and softening the sheet, means for applying the longitudinal draft to the sheet, and means for grasping the edge portions of the softened sheet between the bending device and the drawing means, and stretching the sheet laterally to flatten the same and remove waves and wrinkles.

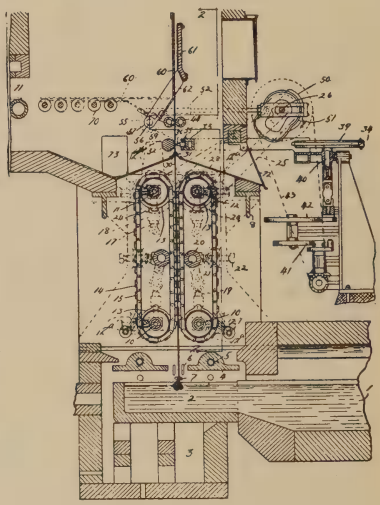


38. Sheet-glass-drawing mechanism. MICHAEL J. OWENS. U. S. 1,466,457, Aug. 28. In a sheet glass drawing machine, in combination with a draw-pot containing

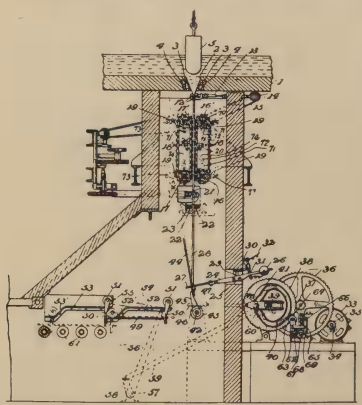
the molten glass from which the sheet is drawn, a transverse supporting member beneath the pot positioned parallel to the line of draw of the sheet, the member having its under side cut away to form a series of open arches, and its upper pot-supporting side beveled at the edges leaving a narrow continuous strip in unbroken contact with the pot.



39. Sheet-glass drawing and delivering mechanism. INGLE B. BUSARD. U. S. 1,466,421, Aug. 28. In an app. for drawing sheet glass, means for drawing a sheet of glass vertically, a horizontal leer conveyor, means for scoring the continuously advancing sheet at spaced intervals, a clamping plate movable against one face of the sheet to break off the section at the score, a supporting frame against which the severed sheet section is clamped by the clamping plate, means for successively moving the clamping plate against the sheet, swinging the plate, sheet section and frame into a horizontal plane, and quickly returning the clamping plate to its vertical position, the carrier frame remaining in horizontal position until it has delivered the sheet section to the leer conveyor, then returning to receive the next sheet section. In combination, means for drawing sheet glass and means for scoring the sheet at right-angles to its length as it is being drawn comprising an endless carrier, a scoring device carried thereby, means for intermittently driving said carrier, and means for guiding said endless carrier obliquely across the face of the moving sheet, the inclination of said guiding means being adjustable to conform to the speed at which the sheet is drawn.

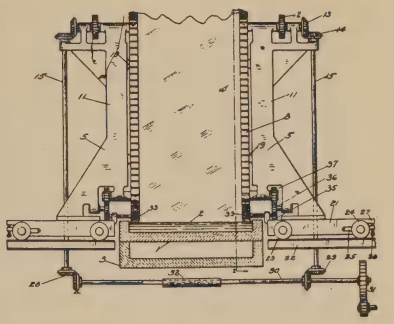


40. Sheet-glass-drawing mechanism. ROBERT P. CALLARD. U. S. 1,469,379, Oct. 2. In a mach. for drawing sheet glass, the combination of a receptacle for molten glass having an oblong slot or opening in the bottom thereof, water-cooled channels arranged on opposite sides of said opening to regulate the temp. of the glass flowing through said slot or opening, width-maintaining means, vertically moving sheet-drawing mechanism drawing the sheet downward, intermittently-operated scoring mechanism for scoring the drawn sheet, and an intermittently-operated carrier for breaking the sheet along the scored line, and a carriage to which the severed section is delivered by said carrier.

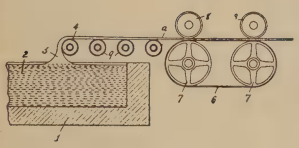


41. Drawing continuous sheet glass. ROBERT P. CALLARD. U. S. 1,469,380, Oct. 2. In combination, means to hold a supply of molten glass from which the glass sheet is formed, a pair of opposed chains at each edge of the sheet for gripping the sheet and continuing in gripping engagement therewith during a predetermined length of

movement of the sheet, and sep. means carrying and guiding the movements of the pairs of chains and adjustable to dispose the sheet gripping flights of the chains parallel to the longitudinal centerline of the sheet or at an angle thereto.

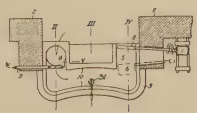


42. Method of and apparatus for producing continuous sheet glass. JOSEPH P. CROWLEY. U. S. 1,469,383, Oct. 2. In a sheet glass producing app., a source of molten glass, a graphite-clay hopper into which the glass flows from the source, there being a slot in the bottom of the hopper through which the glass flows in sheet form, a graphite-clay slab below the hopper, having a concave outer surface for deflecting the sheet into a horizontal plane, and drawing and flattening mechanism for carrying away the sheet.

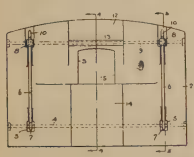


43. Glass-feeding mechanism. EDWARD MILLER. U. S. 1,470,023, Sept. 25. The combination with the discharge spout of a glass tank having an outlet opening of a mold adapted to be located at a lower level than the spout but not in vertical alignment with the opening thereof, means held stationary with relation to the mold for receiving the charge of glass and guiding it to the mold, and means for controlling the movement of the glass from the spout to said glass receiving and guiding means including a member having an opening through which the glass is adapted to flow, a knife for severing the glass, a shear arm mounted below the spout under the discharge opening from the spout, means for reciprocally mounting the knife on the underside of said shear arm in position to sever the glass and temporarily close the bottom of the opening through the shear arm to form a cup for temporarily supporting the unsevered portion of the glass, and means for elevating the shear arm after the glass has been severed.

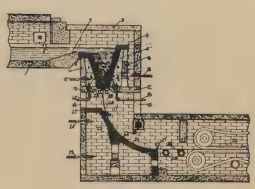
44. Manufacture of glassware. ROBERT GOOD. U. S. 1,469,457, Oct. 2. In app. for making articles of glass, a fur. or tank, a channel for the molten glass communicating at both its ends with the main body of the glass in the furnace, means for causing the molten glass to flow through the channel, the breast of the fur. immediately above the inner edge of said trough being slotted to permit the escape of ht. from within the fur. chamber to maintain the glass in the trough in a highly heated condition.



45. Door for glass-pot furnaces. CHARLES H. CHRISTIE. U. S. 1,469,358, Oct. 2. A fur. door comprising a body portion made up of refrac. mat., longitudinally extending metal rods embedded in said refractory material, said rods being exposed for a portion of their length near the ends thereof, and upright rods on the outside of said door engaging said rods at the exposed portions, and connecting means at the upper ends of said rods for attaching lifting chains.



46. Method of making sheet glass. JOSEPH P. CROWLEY. U. S. 1,469,382, Oct. 2. The method of forming sheet glass consisting in drawing a mass of glass from a molten source, passing the mass laterally while in a highly heated plastic condition over a bend-



ing member and extending it lengthwise to form a sheet before it cools sufficiently to lose its plasticity.

47. Glass manufacture. CORNING GLASS WORKS. Brit. 192,919, Feb. 7, 1922. The colors due to metallic salts in glasses, particularly the borate glasses colored by CoO or NiO, are modified by adding a substance or substances contg. one or more of the halogens. When KCl is added to the batch of glass contg. a very high proportion of boric oxide and colored with CoO, the resultant glass has a green color instead of red. The color change is less noticeable when the proportion of boric oxide in the glass is low or when other halide salts are used instead of the chloride. (*C. A.*)

48. Glass manufacture. V. HORDK. Brit. 112,713, Feb. 5, 1923. A resistance glass is made from a batch contg. 60–70% of SiO_2, 15–30% of boric oxide, 1–2% of K_2CO_3, 3–6% of Na_2CO_3, 2–6% of kaolin, up to 4% of mica, and 1–3% of an oxide of the silicon group, *e. g.*, Zr or Ti. The glass is stated to have a low coeff. of expansion, a high fusing point, and great resist. to chem. action. (*C. A.*)

Heavy Clay Products

49. Highly porous insulating brick. ANON. *Brit. Clayworker*, **32**, 169–70(1923).—Brick having a high porosity are used for insulating purposes for (*a*) in houses, offices and other buildings, in order that a thin wall may be used as effectively as a thick wall for keeping rooms warm in winter and cool in summer; (*b*) as sound absorbers, to insulate rooms which are required to be quiet, from places which are noisy; and (*c*) in fur. and kilns in order that high temps. may be maintained with a minimum fuel consumption. Bricks of the (*a*) and (*b*) types are made of red-burning plastic clay, to which a large propn. (usually an equal volume) of fine hardwood sawdust, seeds, ground lignite, or peat, coal dust, locomotive ashes or other combustible material has been added. For building purposes a highly porous brick measuring 9″ by $4^1/_2$″, by $2\,^5/_8$″ ought not to weigh more than 5 lbs. and should have a crushing strength of about 90 tons per sq. ft. Insulating brick for fur. are made by mixing kieselguhr with 10 to 20% clay. Instead of a clay bond, lime may be used as in the manuf. of silica brick. The propn. of lime required for these is usually about 6% while that required for silica brick is only 2%. H. G. S.

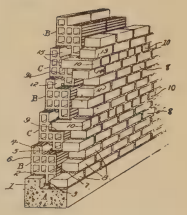
50. Sand lime brick. H. D. SEARLES-WOOD. *Brit. Clayworker*, **32**, 22(1923).—A high Ca lime is best for sandlime brick. This should analyze 90–95% CaO with less than 0.5% MgO. The av. crushing strength requirements for different uses are as follows: engineering brick = 2800 lbs. per sq. in.; brick for external walls = 2000 lbs. per sq. in.; and brick for internal walls = 1000 lbs. per sq. in. H. G. S.

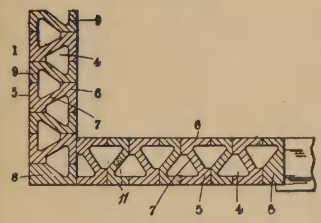
51. Building material industries in Czechoslovakia. RUDOLPH BARTA. *Rev. Mat. Constr. Trav. Pub.*, **166**, 162–3(1923).—Czechoslovakia produces annually 2,000 million brick and 200 million tile in 700 large plants; 220,000 short tons of kaolin, 75% being exported to Ger.; 33,000 tons of porcelain in 70 plants, 70% being exported mainly to the Balkans and the U. S.; 440,000 tons of refractory brick; 22,000 tons of faience; 60,500 tons of common and chemical stoneware; 99,000 tons of slabs; 550,000 tons of Portland cement; 990,000 tons of lime. L. N.

52. Kieselguhr mining. ANON. *Oil & Colour Trades Jour.*, **54**, 823(1923).—A company has recently been formed in Sweden for the exploitation, for use as a building mat., of the large deposits of kieselguhr in the polder of the former lake of Jallasjo, near Vanas Sag, in the Province of Kristianstad. This deposit differs from all others in that there is a natural intermixture of about 20% bituminous products, which form an excellent binding material. O. P. R. O.

PATENTS

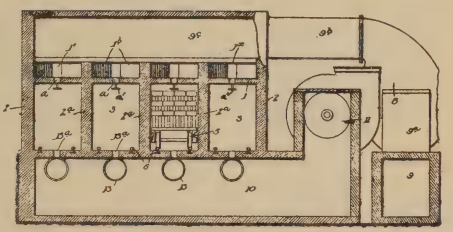
53. Hollow-tile wall construction. RICHARD S. REQUA. U. S. 1,467,117, Sept. 4. A wall structure of brick facing having a header course and hollow-tile backing, the tile being of substantially Z form with the tile opposite the header course of brick broken away to receive the header brick, the tile above such header brick being of normal form and resting directly upon such header brick.



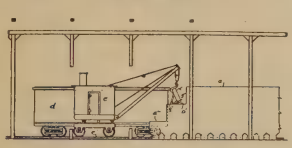


54. Building brick, block, and the like. JOHN VER MEHR. U. S. 1,468,892, Sept. 25. A structure composed of blocks of substantially Z or S shape in plan, arranged in courses one above the other the blocks in a course being assembled or arranged alternately in Z and S formation each alternate block being of less width than the adjacent blocks and constituting a header block.

55. Apparatus for drying brick and other clay articles. JOHN C. BOSS. U. S. 1,468,990, Sept. 25. Apparatus for drying brick and other clay products comprising a series of closed tunnels arranged side by side and having means for admitting loaded cars thereto, conduits above and beneath said tunnels, and communicating therewith, a transverse flue located above the upper conduits and communicating therewith, a blower for supplying heated air under pressure to said transverse flue, a second transverse flue beneath the tunnels communicating with all of said lower conduits, and a suction fan for exhausting air from said second transverse flue.



56. Method of and means for handling and hacking bricks. FRED S. WALLACE. U. S. 1,469,200, Sept. 25. The method of hacking bricks, which consists in assembling in a conveyor at the kiln a complete vertical tier of such bricks the full width of the coöperating carrier, moving the conveyor and contained bricks to said carrier, and placing said tier of bricks as a whole upon the carrier, substantially as set forth. A conveyor for hacking bricks, comprising a wheeled truck, a support for a separate bottom row of bricks, means for withdrawing said support, and a plurality of stationary arms adapted to sustain a vertical tier of bricks, substantially as set forth.



Refractories

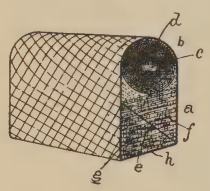
57. Magnesite production in Austria. ANON. *Brit. Clayworker*, **32**, 174(1923).—The Austria-American Magnesite Co.'s works at Radentheim in Carinthia. The deposit lies on a plateau at an altitude of 1700 m. From here magnesite is transported by aerial cable 9 km. long. Grading and selecting is unnecessary. It is calcined at 1600–1700°C. One of the rotary kilns is 50 m. long and has a diam. of 1.8 m., its output being 55 T. of calcined magnesite in 24 hrs. Another kiln is 100 m. long and has a diam. of 2.85 m., its output being 200 T. per day. The coal consumption is 30 to 40%

of the output tonnage and is introduced in the pulverized form. The calcined product analyzes between the following limits: MgO = 85–88%, CaO = 1.5–2.5%, Fe_2O_3 = 4–5%, Al_2O_3 = 1–5%, SiO_2 = 4–6%. As the fumes are injurious to vegetation the spent gases are carefully purified before being released into the air. Attached to the works is a brick plant where calcined magnesite is mixed with 5–7% water and pressed in to brick with a press. of 1000 kg. per sq. cm. They are then fired at 1500–1520° C in a fur. tunnel through which they are passed. H. G. S.

58. A new refractory material. W. Smith. *Tonind.-Ztg.*, **47**, 530(1923).—Clay is impregnated with C by heating it together with coal at low temps. The clay thus treated may be bonded with tar and the products made in this manner are fired before using. It is claimed that this will make an excellent refractory being very resistant to slag action. H. G. S.

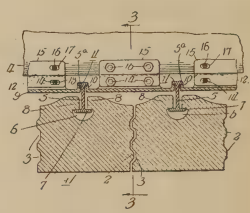
PATENTS

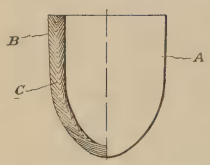
59. Refractory furnace linings. E. Cone and J. W. Hale. Eng. pat. 199,144, March 17, 1922. The inner lining of the fur. is constructed of a wall, one brick thick and the space between it and the outer wall filled with a rammed-in plastic mass of the compn.; graphite 50, fireclay 25, silica rock 5, magnesite 5, anhydrous gas tar sufficient to render plastic. Alternatively the plastic mass may extend with the brickwork in layers to the inner surface of the furnace. The method is applicable to basic, neutral, or acid refrac. mats. (*Jour. Soc. Chem. Ind.*) O. P. R. O.



60. Packing for pistons. Theodore A. Meyers. U. S. 1,467,113, Sept. 4. An expansible packing embodying a resilient section provided with a tubular rubber core, a pair of parallel fabric body triangular sections, and a jacket for assembling said sections as a unit.

61. Firearch. Herman A. Poppenhusen and Arthur P. Strong. U. S. 1,466,751, Sept. 4. A firearch, comprising an upper structure, a plurality of contacting tiles arranged in rows beneath the same. I-beams engaged with said tiles and projecting above the same, plates extending between and engaged with said I-beams above said tiles for suspending the I-beams from said plates, said plates extending over the joints between said tiles for preventing the downward passage of air between said tiles, means for preventing the passage of air between said plates and I-beams, and means for suspending said plates from said upper structure.





62. Graphite crucible. Kozo Nakamura. U. S. 1,466,739, Sept. 4. A crucible having the side walls thereof constructed of a plurality of superimposed substantially V-shaped layers of graphite.

Whiteware

63. Symposium on casting. *Ceramist*, Spring Quarter, 6–27(1923).—Andrew Foltz describes an arrangement for prepg. casting slip and distributing it throughout the shops by means of compressed air. Eric Turner:—Cast saggers cost slightly more than machine or hand made, but they carry a load better. This is attributed to a denser structure which is not disturbed by subsequent repressing. Cast slabs used as targets in oil-fired fur. have the advantages of dense structure and also a thin, but dense surface skin. The grog slip is prepd. in much the same manner as whiteware

slip, excepting that the body is not filter pressed. A mixt. which has given satisfactory service (for saggers?) in general ware and sanitary kilns is as follows:

	Per cent
No. 1 fire clay	25
Plastic fire clay	25
1/4-in. grog	25
1/8-in. grog	25
Water glass	.25 of 1%
Sodium carbonate (crys.)	.20 of 1%

The larger plaster molds used for casting grog bodies should be reinforced on the outside with wood or metal. Wares with max. thickness of 1–1 1/2″ can be cast in the same mold every 6 hrs., while pieces 4 or 5″ thick require 16 to 24 hrs. in the mold. The continuous circulation of hot air around the outside of the mold facilitates the casting operation. 30 slabs measuring 4′ x 3′ x 4′ 1/2″ were cast out of the same mold in as many days. LESLIE BROWN:—For use in the casting of hollow tableware and for a combination of cast and jiggered tableware the materials are first carefully air dried. The body is ground in a ball mill for a definite number of evolutions; the electrolyte is then added and the grinding continued for one hour. The slip is forced by air pressure from the mill through a fine bronze lawn of 200-mesh, passed over electromagnets into agitators and then forced by pumps through galvanized iron pipes for a distance of 500 ft. on the ground floor and then to the 3rd floor of the building where it is used. The dried scrap is weighed, blunged with the necessary amt. of water to which has been added the electrolyte. In ball mill grinding, the wt. of the flint pebbles should be checked very accurately. The actual loss by wt. of a total of 2900 lbs. of pebbles has been found to be 56 lbs. at the end of a 6-day grind. In other instances, the loss averaged 12 lbs. T. A. KLINEFELTER:—The formation of balls or kernels in the ware in casting high tension elec. porcelain is experienced in pieces having a thickness greater than 1″. The use of ht. under the molds to keep them thoroughly dried out during casting was found to be of some assistance in making thick ware. TAINE MCDOUGAL suggested the practice of using a certain propn. of the porcelain body in a calcined ground condition which is being done in the spark plug industry. 45–50% of the body is being calcined to pass 120-mesh. F. W. DINSMORE:—Pieces of elec. porcelain ware 2″ and 2 1/2″ thick are being successfully cast with practically no loss through cracking. These pieces measure from 25″ to 26″ long and 7 1/2″ to 8″ in diameter with corrugations the full length. R. H. MINTON:—Molds used in Germany for casting are constructed with thin walls reinforced with outside straps of iron. C. W. P.

64. The burning of porcelain with fuel oil. A. GRANGER. *Chimie et industrie*, **Special No.,** 330–2(May, 1923).—Operations at the Royal Copenhagen Porcelain Works and at Sèvres have shown that fuel oil can be successfully used and is much more flexible than coal or wood. A. P.-C. (*C. A.*)

65. The re-circulation drier uses little power. H. H. HALLATT. Can. Natl. Clay Prod. Assn., *20th Annual Rept.*, **16**(1922).—The power to operate this drier of nine re-circulating fans, designed by H. of the Tilsbury Brick and Tile Co. (Ontario, Can.), is actually less than 1 h. p. The drier itself is of brick, concrete and steel construction; its capacity is easily a 24-ft. kiln full, or approx. 20,000 4-in. tile per day. H. claims that capacity output on 5 by 8 by 12 in. bldg. tile has been handled by this drier, with practically no waste, and these blocks are the hardest pieces they have. The drier is a 6 track re-circulating waste heat drier and is 63 ft. long and 28 ft. wide. 74 drier cars are used. The drier itself holds 54 cars at one time, 2 shoves are made during the night; the cars are pushed by one man through this short drier without the use of a jacking

app. Re-circulation of drying air is a necessity if the best results are to be obtained. The drying air passing horizontally along the side and top of a tunnel makes the drying of tender clays made into hollow wares and drain tile practically impossible without excessive cracking. By re-circulating the drying air, thus breaking up the hot and cold currents and by forcing the air either up or down through the hollow ware standing on end on the cars, ideal control of the drying and complete saturation of the drying air is possible, which makes possible drying with the utmost economy. This drier is equipped with 9 Ventura fans (48 in.) and 2 exhaust fans. 5 h. p. is actually required to operate all the fans, although the drier motors used have a combined capacity of the 11 h. p. The fans are so arranged that 1 motor or engine would be sufficient. Illus. O. P. R. O.

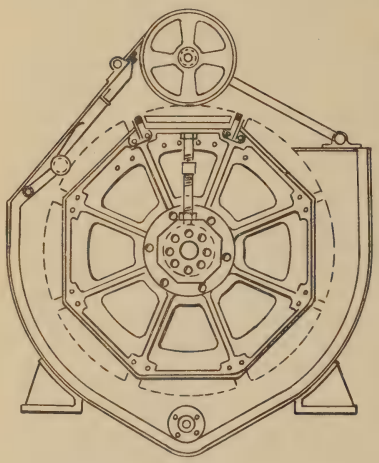


FIG. 1.—Filtering drum.

66. A continuous filter press for ceramic slips. ALIX. CORNILLE. *Rev. Mat. Constr. Trav. Pub.*, **166**, 123–7B(1923). (English translation in *Chem. Age* (London), Supplement, **9**, 9–10(1923). Abstr.)—Description of the Hertenbein continuous filter press (with 7 figures). In a horizontal semi-cylindrical vat, contg. the slip, the filtering drum having an octagonal cross-section is made to rotate about its horizontal axis. Eight boxes having flat bottoms and cylindrical tops are attached to the drum, forming a complete outer cylindrical surface. Each curved segment is perforated and covered with a filter cloth, that is easily replaceable. Two holes in the bottom of each box allow compressed air through one and suction through the other to be applied to the filter cloth. The suction pipe lines lead to the shaft of the filtering drum through one end to a pump, while the compressed air lines lead to the other end of the shaft into a reservoir and then back to the same pump. As a box enters the slip in the vat the openings in the suction line are engaged so as to cause a partial suction in the box, thereby drawing the water through the filter cloth and leaving the concd. ceramic paste on the surface of the cloth, for a rotation of 245 degrees of arc. On leaving the slip the filter cloth with its layer of paste is dried by further suction through 45° of arc. The cycle is completed by having the paste removed by a counterpoised roller touching the filter cloth, with the help of the compressed air which is automatically directed against the filter cloth from the underside. The paste is removed from the roller by a scraper. The box with its filter cloth then again enters the slip. With all 8 filter cloths in position the drum works with $^{11}/_{16}$ of its surface immersed in the slip. Provisions are made for removing the excess water collected, and for regulating the air pressure. A small model with a 12-in. diameter drum was capable of treating 330 lbs. of kaolin per hour. L. N.

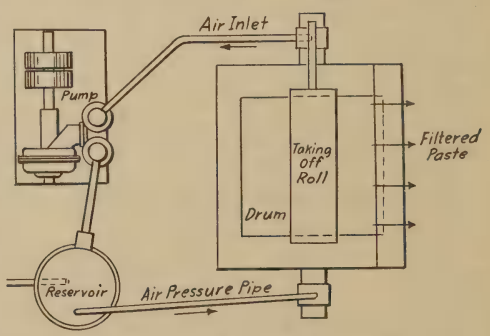
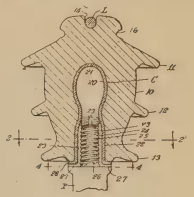
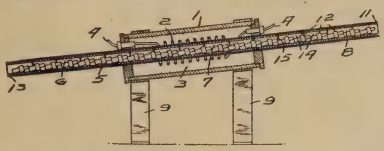


FIG. 2.—Filter with accessories.

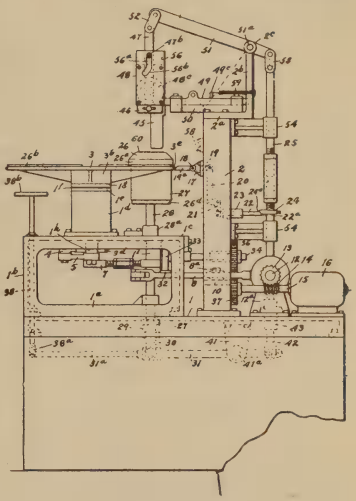
PATENTS

67. Line insulator. LOUIS STEINBERGER. U. S. 1,468,044, Sept. 18. An insulator having a hollow metallic thimble secured thereto and forming a chamber therein, said thimble being provided with an expanded upper portion and longitudinal ribs on its lower portion, said thimble being provided with screw threads and a protecting flange, the inside of said ribs being provided with grooves to form passageways to permit of communication between the interior chamber of said thimble and the atm. when said insulator is mounted upon a supporting pin.



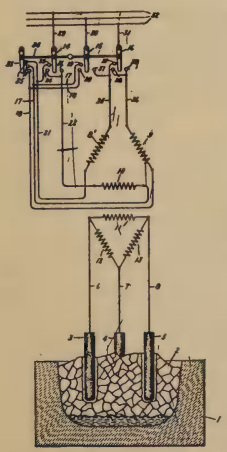


68. Furnace for decorating ceramic ware. JOSEPH A. JEFFERY. U. S. 1,468,947, Sept. 25. In a fur. for progressively heating bodies, a metallic tubular member in which the bodies are placed, a means for heating the tubular member, a porcelaineous lining located in the tubular member for protecting the bodies and the walls of the tubular member.

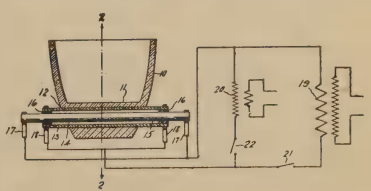


69. Pottery-forming machine. MARTIN BURGER. U. S. 1,469,378, Oct. 2. In a mach. for shaping plastic mat., a support, a plunger, a former tool carried by said plunger, means for actuating said plunger, and means for guiding and moving said plunger and former tool laterally while being actuated by said plunger actuating mechanism.

70. Electric furnace apparatus and method of operating the same. JOHN A. SEEDE. U. S. 1,466,603, Aug. 28. The method of operg. an elec. arc fur. supplied with alternating current which consists in first operg. the fur. with a short arc, thereupon increasing the length of arc while maintaining the current value, and finally reducing the length of arc to operate with a lower energy input.



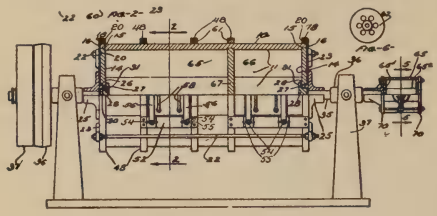
71. Electric furnace. EDWIN F. KIEFER. U. S. 1,467,044, Sept. 4. An elec. fur. of the arc type, comprising a refrac. wall provided with an aperture, and a htg. element insertable in such aperture, said htg. element comprising electrodes in arcing reln. to each other in a closed interspace therebetween.



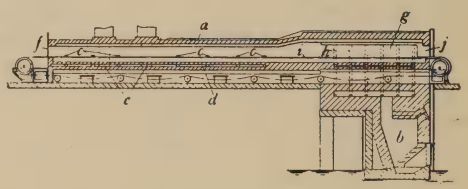
72. Method of and apparatus for drying and conditioning materials. WILLIS H. CARRIER. U. S. 1,467,306, Sept. 11. The herein described method of drying mat. which consists in circulating a body of air through the mat. in a drying chamber, supplying to and mixing with

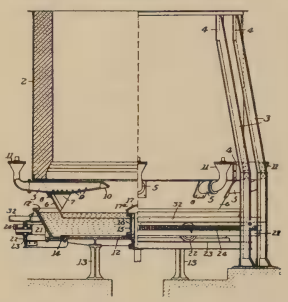
said circulating body of air a relatively much smaller vol. of air, maintaining a predetd. wet bulb temp. of said smaller vol. of supplied air previous to its supply to the chamber by mixing fresh air and return air from the drying chamber and regulating its humidity under the control of the wet bulb.

73. Pulverizing mill. FRANKLIN H. WOLEVER. U. S. 1,468,893, Sept. 25. A mill for pulverizing enamel stock and the like comprising a rotative barrel formed with end walls and a circumferential wall of internal polygonal cross-section, with the segments meeting at angles of from 90 to 135°, all made of vitreous porcelain, the circumferential wall being continuous from end to end and joined to the end wall by internal dry joints, said circumferential wall being made of solid vitreous porcelain staves and being joined along integral beveled edges by internal dry joints to produce the angle specified and means exterior to the internal faces of the joints between the beveled edges of said staves and between the end walls to hold the barrel members rigidly together.



74. Furnace. THEODOR TEISEN. U. S. 1,469,461, Oct. 2. In fur. kilns or leers, the combination comprising a long horizontal cooling chamber through which are conveyed the articles to be treated, a collecting flue located beneath the floor of the chamber, a plurality of passages arranged at intervals in the side walls of the said chamber with their inlet ends at a distance above the floor of the chamber and located between the chamber and collecting flue, and a branch outlet flue for discharging hot gases from the collecting flue, substantially as described.





75. Gas producer. FRANCIS H. TREAT. U. S. 1,469,399, Oct. 2. In a gas producer, a stationary ash pan, a trough surrounding said ash pan, and means for elevating ashes over the peripheral edge of said ash pan and delivering the same to said trough, substantially as described.

Geology

76. Kaolin. ANON. Rept. on Mining Operations in the Province of Quebec during the Year 1922. p. 81–90.—After a period of quiescence, work has been resumed on the china clay deposits of Amherst township and has been pushed actively throughout the year of 1922. The shipments of kaolin during that year amounted to 1296 T. valued at $18,532, of which 1196 tons were washed white china clay, and 100 T. were stained kaolin used as fire clay. The report also contains a summary of the history of these kaolin deposits dealing with origin, distribution, character, composition and development.

O. P. R. O.

77. China clay deposits in Malay. W. R. JONES. *Chem. Age, China Clay Trade Rev.*, Sec. v, **9**, 16 (1923).—Extensive china clay deposits were recently discovered not far from the famous tin mining center of Ipoh, Malay. Exhaustive investigations were immediately carried out to ascertain the exact amt. of raw mat. available before

a pottery was started. These were found to be enormous and the manuf. of pottery has now passed the exptl. stage. O. P. R. O.

Chemistry and Physics

78. The estimation of hydrogen in producer gas. WILHELM. *Feuerungstechnik*, **11,** 171–2(1923).—An indicating and recording device for the continuous detn. of H_2 in producer gas is described. It depends on the very high heat cond. of H_2 compared to the other constituents, which have nearly equal conds. Two fine Pt wires are stretched axially in holes bored in a metal block. The sample of producer gas, cleaned and freed from H_2S by $CuSO_4$, is passed through one hole; air is sealed in the other. A fixed heating current is passed through the two wires, which form two arms of a bridge. A galvanometer gives readings in % H_2 directly. The zero point of the instrument is set to allow for the known effect of CO_2 and CH_4. The instrument is in successful operation, the accuracy being better than 0.5%. ERNEST W. THIELE

79. Analysis of silicates. RUDOLPH BARTA. *Rev. Mat. Constr. Trav. Pub.*, **166,** 156(1923).—In analyzing silicates, decomposable by acids, especially cements, it has been found difficult to filter and separate the silicic acid. Jaroslav Mateyka has traced it to the influence of the chloride $SiCl_2$, $CaCl_2$, in the presence of meta titanic acid. This may be remedied by the addition of ammonium chloride. L. N.

80. The problem of the combination of water in zeolites. O. WEIGEL. *Centr. Min. Geol.*, **1922,** 164–78, 201–8; *Chem. Zentr.*, **1922,** III, 702–3.—The close agreement of the exptl. results of W. (cf. *Sitzungsber. Ges. Beförderung gesamten Naturwiss. Marburg*, **1919,** no. 5; *Chem. Zentr.*, **1920,** I, 242) with those of Scheumann (cf. *C. A.*, **15,** 3804) is emphasized, but it is not considered that the break in the dehydration curve at the 0.5 mol. value for the heulandite reported by Scheumann is exptly. verified. Both investigations show that heulandite contains no H_2O combined such as that in ordinary hydrated salts, but at the best is a special kind of solid soln. which as a result of the directing forces of the relatively rigid silicate lattice on the easily mobile H_2O component shows an analogy to true hydrates. Contrary to Beutell (cf. *C. A.*, **17,** 515) it is maintained that (1) the practically complete reversibility of hydration and dehydration at temps. below 180° are proved exptly. and also that Scheumann has shown that (1) no permanent change is caused by dehydration up to a H_2O content of 3 mols.; (2) contrary to Beutell the curve at low temps. shows almost complete continuity; (3) the breaks in the curve would not appear at higher temps. with integral mols. if any considerable decompn. actually occurred; (4) the curves of Scheumann and W. conform to one another closely up to 200° though the preliminary treatment of the material was different in each case; (5) no evidence was found by optical expts. of decompn.; and (6) Stoklossa observed by optical means no decompn. of the mol. when dehydrated to 2.5% H_2O. Beutell has not proved his assertion that zeolites contain H_2O combined in a manner similar to hydrated salts. C. C. D. (*C. A.*)

81. Colloidal clay. D. CASIMIRO BURGUÉS Y ESCUDER. *Mem. acad. cienc. artes*, **17,** No. 19, 18 pp.(1922).—Ten-g. portions of air-dried, 1 mm.-mesh clay were shaken with 200 cc. 1:1000 soln. of different dyes, and the amt. of unadsorbed dye remaining in each soln. was detd. colorimetrically. Following is the vol. of 1:1000 dye soln. which, if dild. to 50 cc., would match the color of the soln. of unadsorbed dye: "Crystal violet O," 4 cc.; "concd. acid green," 10 cc.; "dianiline red," 10 cc. "Methylene blue DBB" was almost completely adsorbed, and "fuchsin in large crystals" even more so. If 5-g. portions of clay were used, 7 cc. and 2 cc., resp., of methylene blue and fuchsin, when dild. to 50 cc., matched the colors of the unadsorbed dyes. The presence of $CaCO_3$ in the clay did not alter its power to adsorb methylene blue. Other expts., not detailed, indicate that the amt. of dye adsorbed by a clay is not a satisfactory quant. measure of

the colloidal matter in the clay, because other components of the clay may also adsorb dye. This paper is largely a résumé of the work of others. R. H. I. (*C. A.*)

PATENTS

82. Decomposition by acids of siliceous alumina compounds. AKTIESELSKAPET HOYANGFALDENE, NORSK ALUMINIUM CO. Norw. 35,193, July 3, 1922. Clay is treated with H_2SO_4 in a rotary drum coated with acid-resisting material. The acid is applied dropwise in amts. somewhat insufficient for complete decompn. Practice shows that Al_2O_3 is still completely liberated. Heat is produced by the reaction. Accordingly the mass is passed through a heated drum where the temp. is kept above 140° but not so high that decompn. of Al sulfate takes place. By the following extn. Al sulfate (and Fe sulfate) is obtained in the soln. and the remaining undissolved SiO_2 is easy to filter.

General

83. Stain and efflorescence on ceramic products. F. BIGOT. *Rev. Mat. Constr. Trav. Pub.*, **166**, 121–2B(1923).—*Green stain or efflorescence* has been noted to appear on clay bodies heavily charged with mica. A kieselguhr contg. a notable quantity of manganese showed a similar efflorescence on exposure to humidity. A stoneware clay to which had been added 2–3% chromite and burned to 1200° in an oxidizing fire, developed a green efflorescence on exposure to dampness. Calcareous white bodies used for faience, covered with a heavy lead glaze, often show a yellow coloration in the glaze characteristic of lead and chromium—such colorations not being observed in opaque tin glazes. Green stains are produced on clays contg. alkalies, the alk. earths even in large proportions not preventing the formation of sol. salts. Firing with coal containing sulphur seems to aid the formation of such stains. *Lead glazes vs. leadless glazes.* In the manuf. of faience tableware, a yellow stain is often prominent on large pieces requiring time for drying after dipping in a lead glaze, the pieces most often being worthless after firing. However with a leadless, boric acid glaze, no colorations are noticeable. The industry has the choice of eliminating the undesirable colorations by (1) biscuiting the body to a temp. high enough to dissociate completely the complex compds. of lime, silica, carbonic and sulphuric acids (about 1000°), and then using a lead glaze, or (2) by using leadless glazes (boric acid) instead, with the usual biscuit burn. *Grey colorations.* A dull grey coloration visible through a transparent glaze was traced to the presence of calcium sulphide contained in the plaster of Paris used as a mold. The impurity was introduced by the reduction of the gypsum in the hot part of the kettle fired with lignite which gives a long flame. Exposing the clay products having the grey coloration to sunlight restores them to their original whiteness in a few days, whereas exposing them in a humid unlighted place required many months for the same result. L. N.

84. The use of fuel oil in the clay industry. ANON. *Brit. Clayworker*, **32**, 166–8 (1923).—Fuel oil is a well defined product of the distillation of petroleum the lighter oils having been removed. This viscous oil has certain well defined phys. and chem. properties. At 60°F the sp. gr. = 0.95; the flash point is above 150°F; the S in it is about 3.5%; the calorific value is about 18,750 B.t.u. Its flame temp. is high and is above that required in any operation connected with clay working. Hitherto, brick burning with oil has not been successful and has not been studied technically in a systematic way. The reason for this is that the types of burners used until recently have not proved satisfactory. Further expts. in the use of oil for burning brick may be successful. For drying china clay it has recently been found very satisfactory. The cost of drying clay was reduced in one case from 8s. 6d. to 7s. 9d. per ton of clay by using oil firing instead of coal. H. G. S.

85. Saving coal in ceramic plants. BASCHANT. *Deut. Töp. Zieg. Ztg.*, **54**, 239–40, 247–48(1923).—In firing boilers the grate area should be ample so that rushing the fire will be unnecessary. If the grate bars are set high the fresh air will prevent the bars from becoming overheated. Coals producing a large amt. of soot should be avoided since the soot becomes caked on the pipe acting as an insulator. In some cases it is more economical to use coals with a low B.t.u. value. With boilers in which a low temp. must be maintained coals having a low B.t.u. value are most economical and produce a more uniform ht. A boiler scale 1 mm. thick will increase the fuel consumption 5%. To distil impure water, the hot steam may be led through tanks and thus preheat this water. When possible soft water should be employed for boilers. After installing a water purifying equipment in a plant it was not necessary to clean the boilers so often. This equipment consisted of one 3 m. high cylinder and one 1 m. high. The water was pumped into the 1 m. cylinder through a sand filter into the 3 m. cylinder then heated to 50–60°C by means of exhaust steam coils, which caused the sediment to settle. For well water the amt. of $CaCO_3$ and $CaSO_4.2H_2O$ should be detd. and the corresponding amt. of Na_2CO_3 or scale preventor should be added. When using impure water it is good practice to fill up the boiler above the water line every night. Before firing the boiler the next morning, drain the boiler to the water line and it will be found that a large amt. of sediment will be removed. If the plant is shut down in the fall, clean the boilers by applying a mixt. of 3 parts wood tar and 1 part graphite to the interior of the pipe and remove by means of a boiler brush. A common mistake is to fire boilers to produce a min. pressure. A boiler producing a pressure of 10 atmos. requires a temp. of 183.1°C and consumes 667.1 cal. of ht. The same boiler operated at 6 atmos. requires 164.6°C and consumes 662 cal. About 62.95% coal is actually utilized in htg. up the water, 22.1% is lost in waste gases, 7.47% is lost in unburned coal in the ashes and in cinders and 7.57% is lost by conduction. H. G. S.

86. Ceramic ware for machines. F. SINGER. *Zeit. Verein. Deut. Ingenieure*, **24** (1923); *Tonind. Ztg.*, **47**, 537(1923).—S. calls attention to the fact that certain ceramic products can be used to replace many cast iron parts on machines now being used in the shops of various manuf. plants. H. G. S.

87. Ceramic work. W. G. WORCESTER. Can. Natl. Clay Prod. Assn., *20th Ann. Rept.*, **7** (1922).—Ceram. work has been undertaken by the Sask. Govt., because it has long been recognized that the province is preëminent as to its raw mat. for the production of brick and pottery. A dept. of ceram. has been established in the University of Sask., with a very complete ceram. lab. for the testing of all grades of clay. A Clay Products Intelligence Bureau has been formed, and Sask. brick, tile, pottery and raw clay have been exhibited at her largest cities. A careful and systematic survey of the more outstanding undeveloped clay deposits is under way. Up to the present there have been tested fire clays, china clays, including the ball and stoneware clays, terra-cotta clays, paving brick, buff and red face brick clays, numerous clays for the manuf. of the more common lines of clay products and clay for paint and paper manuf. O. P. R. O.

88. Education—old style. EDITORIAL. *Nat. Resources*, **1** [1], 2(1923).—Importance is emphasized of recent expts. by the U. S. Bur. Mines in coöperation with the Central of Ga. Ry. in the ceram. interests of Ga. ED.

89. The lime, cement, ceramic and glass laboratory of the Conservatoire National des Arts et Métiers, Paris. ANON. *Recherches et inventions*, **4**, 690–6(1923).—Description of the equipment. A. P.-C. (*C. A.*)

PATENTS

90. Heat-insulating material and method of manufacture. OSCAR GERLACH. U. S. 1,468,149, Sept. 18. A method of preparing a ht. insulating compn. including

adding a sol. metallic salt to a soln. of a silicate, sepg. the gelatinous ppt. so formed from the salts in soln., and mixing the sepd. ppt. while it is still moist with infusorial earth.

91. Elutriation of clay and kaolin. B. SCHWERIN. Can. 233,737, Aug. 21, 1923. The clay is put into suspension and brought to the sol. condition by the addition of a suitable electrolyte, it is then allowed to settle. (*C. A.*)

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